# Environmental Chemistry Data from an Arctic Marine Environment at Cape Hatt, N. W. T. : 1981-1982

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Canadian Data Report of
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# ENVIRONMENTAL CHEMISTRY DATA FROM AN ARCTIC MARINE ENVIRONMENT AT CAPE HATT, N.W.T: 1981-1982

A data report to the Baffin Island Oil Spill (BIOS) project

by

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ABSTRACT

Bunch, J. N., C. Bédard and F. Dugré. 1985. Environmental chemistry data from an arctic marine environment at Cape Hatt, N.W.T.: 1981-1982. Can. Data Rep. Fish. Aquat. Sci. 578: x + 83 p.

During a four-year period, the Baffin Island Oil Spill (BIOS) project undertook a series of integrated studies involving physical, biological and chemical components, before, during and after experimental releases of petroleum and chemical dispersant. Environmental chemistry data were obtained primarily in support of benthic and microbiological studies. These data, from water column and sediment during 1981 and 1982, are presented, together with the techniques employed. Data from the water column include temperature and salinity, concentrations of nitrate and phosphate, dissolved and particulate organic carbon, chlorophyll a and phaeopigments. Data from surface sediments include total organic carbon, and concentrations of phosphate, nitrate and ammonia in interstitial water.

KEY WORDS: Arctic, petroleum, dispersant, oil spill, water, temperature, salinity, organic carbon, chlorophyll a, interstitial, sediment.

RESUME

Bunch, J. N., C. Bédard and F. Dugré. 1985. Environmental chemistry data from an arctic marine environment at Cape Hatt, N.W.T.: 1981-1982. Can. Data Rep. Fish. Aquat. Sci. 578: x + 83 p.

Sur une période de quatre années, le projet BIOS (déversement de pétrole sur l'île de Baffin) a mis sur pied une série d'études portant sur les composantes physiques, biologiques et chimiques enregistrées avant, pendant et après des déversements expérimentaux de pétrole et de dispersant chimique. Les données de chimie environnementale ont été obtenues principalement pour étayer les études benthiques et microbiologiques. Les données relatives à la colonne d'eau et aux sédiments pour 1981 et 1982, sont présentées conjointement aux techniques employées. Pour la colonne d'eau, les données comprennent la température et la salinité, les concentrations de nitrate et phosphate, du carbone organique dissout et particulaire, de la chlorophylle a et des phaeopigments. En ce qui concerne les sédiments de surface, les données portent sur le carbone organique total et les concentrations de phosphate, nitrate et ammoniac emprisonnées dans l'eau interstitielle.

ACKNOWLEDGEMENTS

We thank T. Cartier, R. Harland, J. Laliberté, and L. Martin for their analyses and discussions. T. Cartier, R. Harland, J. Laliberté, C. Miquez and L. Ménard capably participated in field collections. J. Lovrity determined salinities. T. Cartier, M. Durand, R. Fortier and C. Trudeau contributed to the preparation of the report. G. Ferrand prepared Figures 5, 7, 9, 11 and 13. F. Cartier prepared all other figures. We thank the personnel of LGL Ltd. for their diving collections. The help of K. MacGregor, N.B. Snow and the camp crew was greatly appreciated. The logistical and financial support of the BIOS project office is gratefully acknowledged.

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## 1.0 INTRODUCTION

The Baffin Island Oil Spill (BIOS) project at Cape Hatt, N.W.T. was a four-year study designed to compare and evaluate the effects of dispersed and nondispersed petroleum in an arctic marine ecosystem during and after experimental petroleum releases in 1981. A summary of this project is given by Sergy (1985). Integrated physical, chemical and biological studies during 1980 yielded baseline data. These data were compared to data in subsequent years up to and including 1983. Studies subsequent to the releases were concerned with acute and long-term effects primarily on benthic invertebrates and plants and benthic microheterotrophs. These studies were reported annually, the latest of which include Cross et al. (1984) and Bunch and Cartier (1984). Syntheses of all studies will be found in a forthcoming issue of Arctic (1986).

This report contains environmental chemistry data obtained in support of biological studies at Cape Hatt during 1981 and 1982. A report of similar data from 1980 can be found in Green (1981). An integration of all environmental chemistry data with microbiological data will be found in the issue of Arctic. The data are in Tables 2 to 9. The data found here are without interpretation but details of the techniques employed are included. Means of the data are summarized in Figures 3 to 19.

## 2.0 METHODS AND MATERIALS

### 2.1 Study Area

The study area is seen in Figure 1. Water samples were collected from the numbered stations in bays 7, 9, 10 and 11 between 1981 and 1982. Because of concern about possible contamination of bay 10 (control bay) during the petroleum releases, bay 7 was chosen as an alternate control bay in 1981. Sediments were collected at all stations in 1981 and 1982. Interstitial water in sediments was collected from one station in each bay during 1982 only.

Fifteen cubic metres of Lago Medio petroleum crude, artificially weathered by 8%, were pumped onto the surface of bay 11 on 19 August 1981, near high tide. The release area was contained by booms and prevailing winds drove the surface slick onto the beach as planned. Petroleum not beached was removed from the water surface by members of the Canadian Coast Guard. At low tide, the intertidal zone of the beach within the contained area was uniformly coated with petroleum from the release.

On 27 August, sixteen cubic metres of the same petroleum crude mixed with Corexit 9527 (10:1) were discharged from a dispersion pipe located perpendicularly to the shore and suspended one metre above the sediment at the south end of bay 9. The petroleum-dispersant mixture moved north through the water column across bays 9 and 10, including the areas of stations 6, 5, 4 and 3 and out into Ragged Channel. Details of the releases can be found in Dickins (1982).

### 2.2 Sampling Protocol

#### 2.2.1 Water Column

Water samples from depths of 1, 5, and 10 m were collected at all stations using a 5.0-L Niskin bottle and hand-line. The samples were transferred to 4.0-L bottles and transported in a sample box to the Cape Hatt laboratory where they were refrigerated and processed within several hours of collection. Water collections from stations in all bays occurred during a two-day period at intervals of approximately one week. Portions of each sample were used in microbiological techniques.

2.2.2 Sediment

Sediments were collected at all stations by divers using modified 50-mL disposable syringes. For each station sampled, seven syringes on average were filled with surface sediments and capped for transportation back to the laboratory. Upon arrival, they were sorted and left to settle in a refrigerated area until processed. The top centimetre of all sediment cores taken from one station were combined and homogenized in a sterile Whirlpak bag (Fisher Scientific). Portions of each sample were used in microbiological techniques. Remaining homogenized sediments were frozen and later shipped to Ste-Anne-de-Bellevue for total organic carbon and dry weight determinations. Sediment was usually collected from all stations during one or two days at intervals of approximately one week.

2.2.3 Interstitial Water

Interstitial water in the top few centimetres of sediment was obtained with a version of the sampling device described by Montgomery et al. (1979). This sampler was modified to sample sediments at a depth of 10 m in conjunction with divers. The inorganic nutrient content (phosphate, ammonia and nitrate) of interstitial water was obtained from these samples.

As illustrated in Figure 2, the interstitial sampler consisted of a 280-mL plexiglass sample reservoir with a removable endcap connected at the top by Tygon tubing to a penlike probe. A three-way stopcock valve was fitted on the tubing to control pressure and water flow. Divers forced the probe deep enough into the sediments to place the porous teflon collar (Fluorocarbon Co., Anaheim, CA) approximately 3 cm below the surface of the sediment. Prior to installation, a vacuum was created in the reservoir with a hand vacuum pump (15 psi). This vacuum was maintained until the probe was inserted into the sediment, after which the three-way stopcock valve was turned to allow a continuous flow of water between the probe and the reservoir. Interstitial water entered through the porous teflon collar over to the reservoir where it

accumulated for several hours. Once full, the samplers were retrieved and returned to the laboratory where the water was processed for inorganic nutrient determinations.

The interstitial sampler left the sediments undisturbed. The sampling procedure could only produce underestimates of nutrients where interstitial water might be contaminated and therefore diluted by overlying, nutrient-poor bottom water. This possibility was minimized by careful attention to the vacuum created in the reservoir. Montgomery et al. (1979) demonstrated a spatial heterogeneity of nutrient concentrations in interstitial water. An attempt was made to reduce this by inserting three interstitial samplers in close proximity to each other in the sediment. After retrieval, duplicate samples were collected from each sampler. Six samples were thus obtained from each sampling area and a mean value was calculated for each bay. The position of the samplers was shifted slightly within the same general area from one sampling interval to the next. This could represent a source of variation between sampling intervals and partly explain the wide range of values observed.

## 2.3 Dry Weight Determinations

For each of the thawed sediment samples, three 1-mL subsamples were measured with a modified 3-mL disposable syringe, put into pre-weighed aluminum boats and dried at 60°C in an oven. After 48 h, the samples were transferred into a desiccator for a period of 30 min and weighed. The results were averaged.

## 2.4 Temperature and Salinity

The temperature of water samples was measured with a laboratory mercury thermometer as soon as they were brought to the surface. Samples for salinity determinations were shipped to the Arctic Biological Station for analysis. Salinities were measured with a

Bissett-Berman model 6230 laboratory salinometer. Temperature and salinity of all microbiological water samples were routinely monitored.

## 2.5 Inorganic Nutrients

Duplicate samples of 100 mL of sea water and interstitial water for nitrate and phosphate determinations were placed in 125-mL Boston Round bottles. Samples of 100 mL for ammonia analyses were prepared in duplicate, and 4.0 mL of 7% phenol were added to each bottle. All samples were frozen and shipped to the Arctic Biological Station for analysis.

Immediately before analysis, samples were thawed in a warm water bath. Reactive phosphate and nitrate analyses were carried out in a Technicon Autoanalyzer II. The procedure of Technicon Industrial Systems (1973) was used for phosphate determinations. This procedure is essentially an automated version of the standard technique described by Strickland and Parsons (1972). The limit of detection for phosphate was 0.02 μmol $L^{-1}$. An automated method of the United States Environmental Protection Agency (1979), involving hydrazine reduction, was used for the determination of reactive nitrate. This procedure was modified to the extent of increasing the concentration of hydrazine phosphate to increase sensitivity. The limit of detection for nitrate was 0.06 μmol $L^{-1}$. Ammonia was determined following Dal Pont et al. (1974).

## 2.6 Chlorophyll *a* and Phaeopigments

One litre volumes of sample water were filtered through 0.45-μm membrane filters (Millipore HAWP0 4700). Filters were fixed with 1.0 mL of $MgCO_3$ and placed in small petri dishes which were wrapped in aluminum foil, frozen and shipped to the Arctic Biological Station for analysis. Chlorophyll *a* and phaeopigments were determined spectrophotometrically by the standard methods described by Strickland and Parsons (1972). Values of chlorophyll *a* were calculated using the equation of Jeffrey and Humphrey (1975).

2.7 Organic Carbon Determinations

Water and sediment samples were analyzed for organic carbon by a procedure which modified and combined those of Menzel and Vaccaro (1964) and Stainton (1973). Aliquots of 100 mL of freshly collected water samples were filtered through pre-ashed (500°C) Whatman GF/C 24-mm glass filters contained on acid-washed glass filter holders. Filters and filtrates were immediately frozen for subsequent analysis at the Arctic Biological Station.

Dissolved organic carbon (DOC) was determined by measuring a 20.0-mL aliquot of the thawed filtrate into a pre-ashed glass ampule. Inorganic carbon was removed from the sample by adding 0.05 mL of perchloric acid and purging with a stream of nitrogen for 10 min. Immediately following the gas purge, 0.1 g of potassium persulfate was added and the ampule flame-sealed. The ampules were then heated to 121°C for 1 h in an autoclave to effect the wet oxidation of organic carbon.

For analysis, each ampule was opened as required, and the content transferred to a 50-mL disposable syringe to which 1.0 mL of 2.0 N $H_2SO_4$ and 30.0 mL of helium were added. The syringes containing the samples were shaken for at least five minutes. The evolved carbon dioxide-helium mixture was injected into a Hewlett-Packard 5700A gas chromatograph fitted with a high temperature nickel catalytic oven where the carbon dioxide was catalytically reduced to methane in a continuous stream of hydrogen. Methane was quantitated by flame ionization and the response recorded on a Hewlett-Packard 3380 recorder-integrator. Values obtained were corrected for sample size and expressed as DOC per litre of sample volume. The analytical procedure was calibrated with prepared glucose standards. The limit of detection for DOC was 54.0 µg C $L^{-1}$.

Particulate organic carbon (POC) was determined from the particulate material retained by the filters used for the filtration of DOC samples. Filters containing the particulate samples were placed in pre-ashed glass ampules with 20.0 mL of prepared water containing a known low amount of carbon. The subsequent procedure was identical to that described for DOC determinations. The limit of detection for POC was 20 µg C $L^{-1}$.

The procedure described above for the determination of POC was subjected to an inter-laboratory calibration under the supervision of Dr. W.J. Cretney of the Institute of Ocean Sciences, Sidney, B.C. The result of this inter-calibration was reported by Green (1981). The table given below was taken from Green and corrected. Values in parentheses were those reported by Green. The results showed satisfactory agreement between the Institute of Ocean Sciences and the Arctic Biological Station.

Table 1. Comparison of organic carbon determinations

| Laboratory | Sample A $\mu g\ L^{-1}$ | Sample B $\mu g\ L^{-1}$ |
|---|---|---|
| Seakem Oceanography Ltd., Sidney, B.C. [2] | 98.7 ± 22.2 | 93.2 ± 21.0 |
| Arctic Biological Station [3] | 40.0 ± 8.6 (70.3 ± 74.7) | 33.2 ± 2.8 (42.8 ± 8.5) |
| Institute of Ocean Sciences Sidney, B.C. [4] | 46.7 ± 19.8 | 42.8 ± 8.5 (33.1 ± 2.8) |

Notes: 1. Values are averages and standard deviations of 6 determinations except sample A of the Arctic Biological Station. This value is the result of 5 determinations. A spurious value of 222.0 was deleted.

2. Wet oxidation, back titration method, corrected for chloride interference.

3. Wet oxidation, catalytic conversion of $CO_2$ to methane, gas chromatograph flame ionization detection of methane.

4. Dry oxidation, measurement of $CO_2$ with a gas chromatograph thermal conductivity detector.

Total organic carbon (TOC) determinations in the sediments were made following a procedure slightly modified from that used for POC samples. Three 1-mL subsamples of each sediment were dried and reduced to powder by means of a pestle and mortar. Three to ten milligrams of the sample powder were added to a pre-ashed and tared ampule, and the exact weight determined. After the addition of 20.0 mL of prepared water supplemented with 0.2 mL of perchloric acid, the subsequent procedure was identical to that for POC. Values obtained were corrected for the amount of sediment employed in the analyses, and TOC was expressed as percent carbon.

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# 4.0 FIGURES

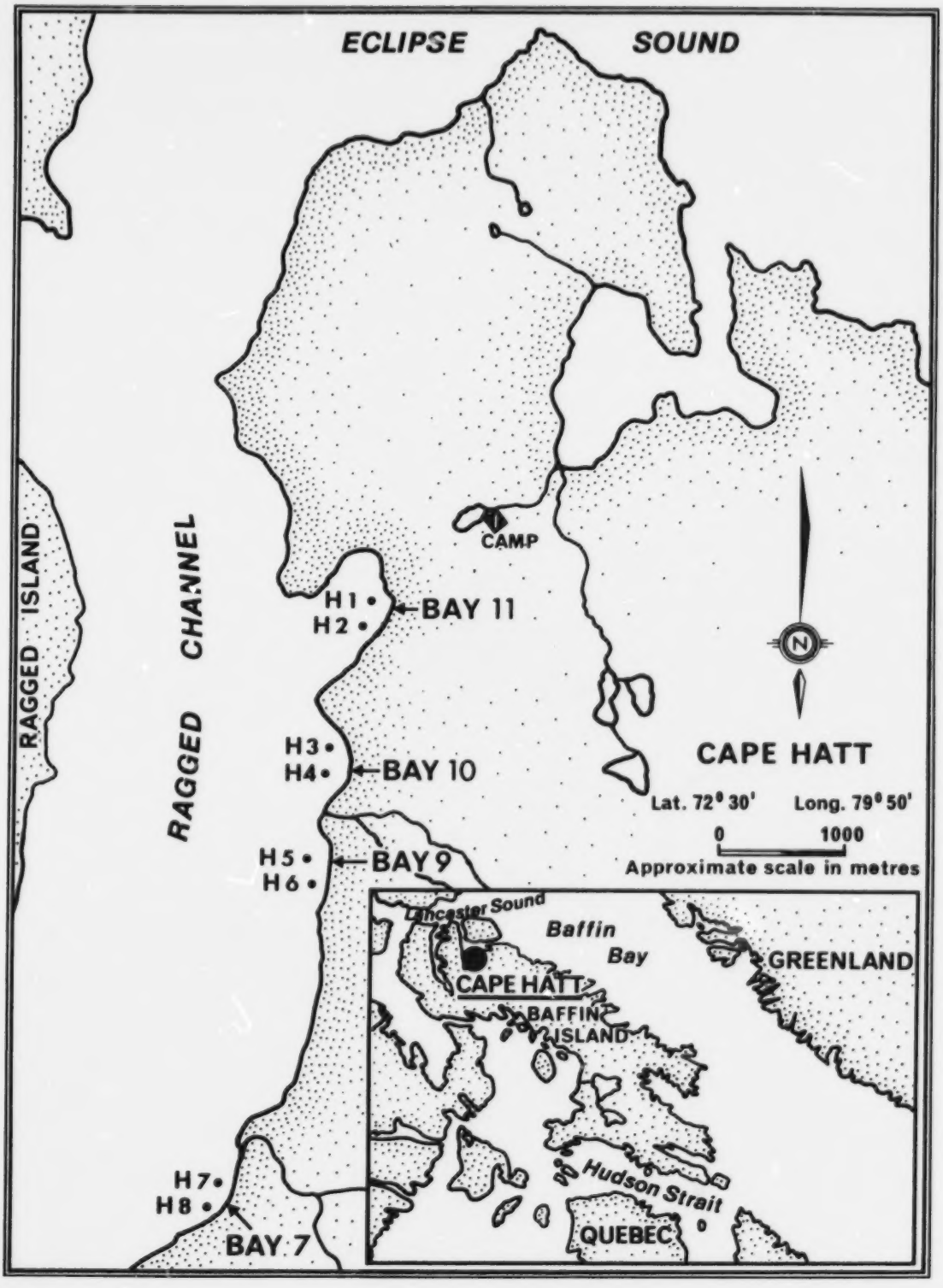


Figure 1. Stations occupied at Cape Hatt, N.W.T. between 1981 and 1982.

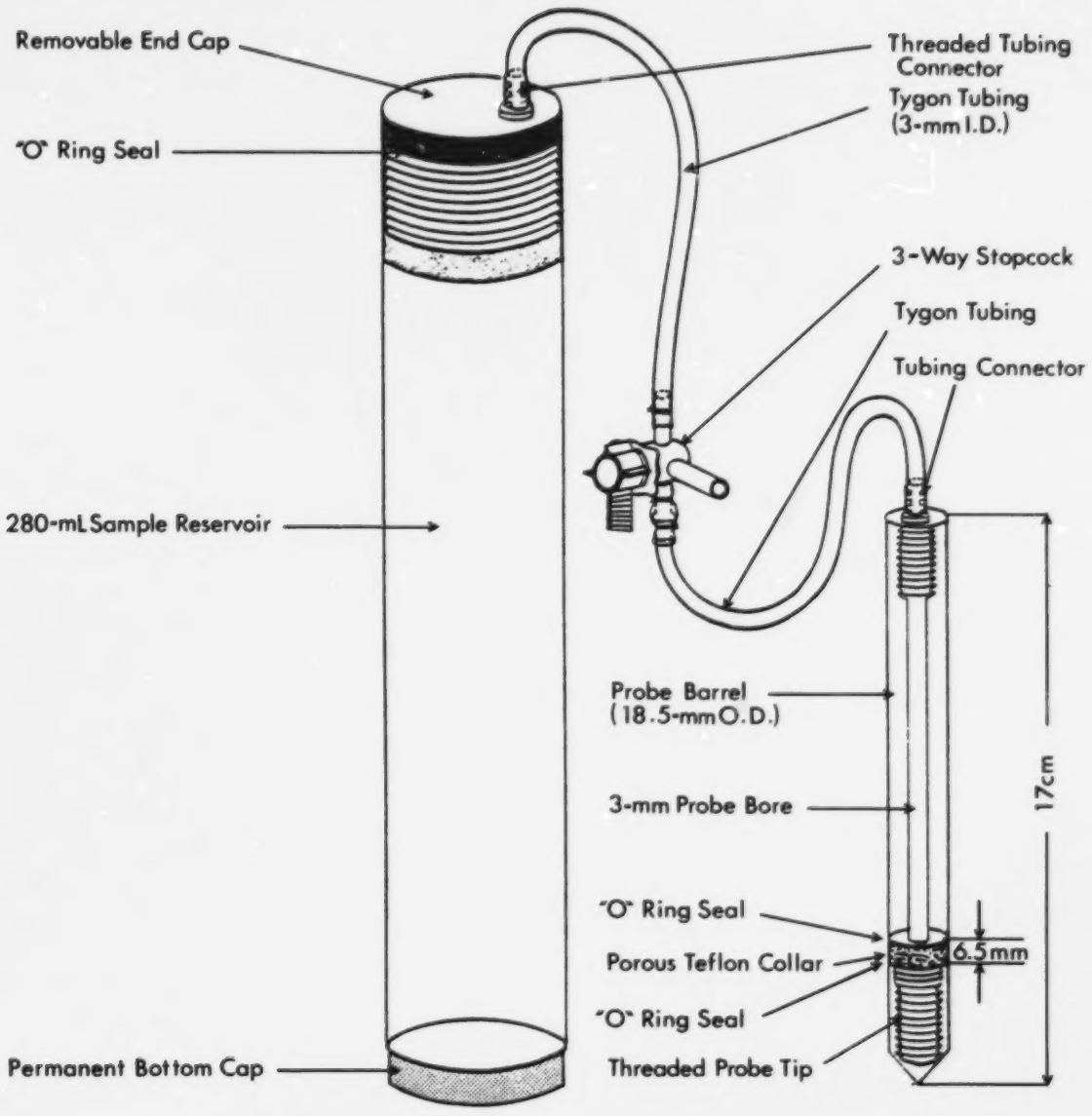


Figure 2. Diagram of in situ interstitial water sampler.

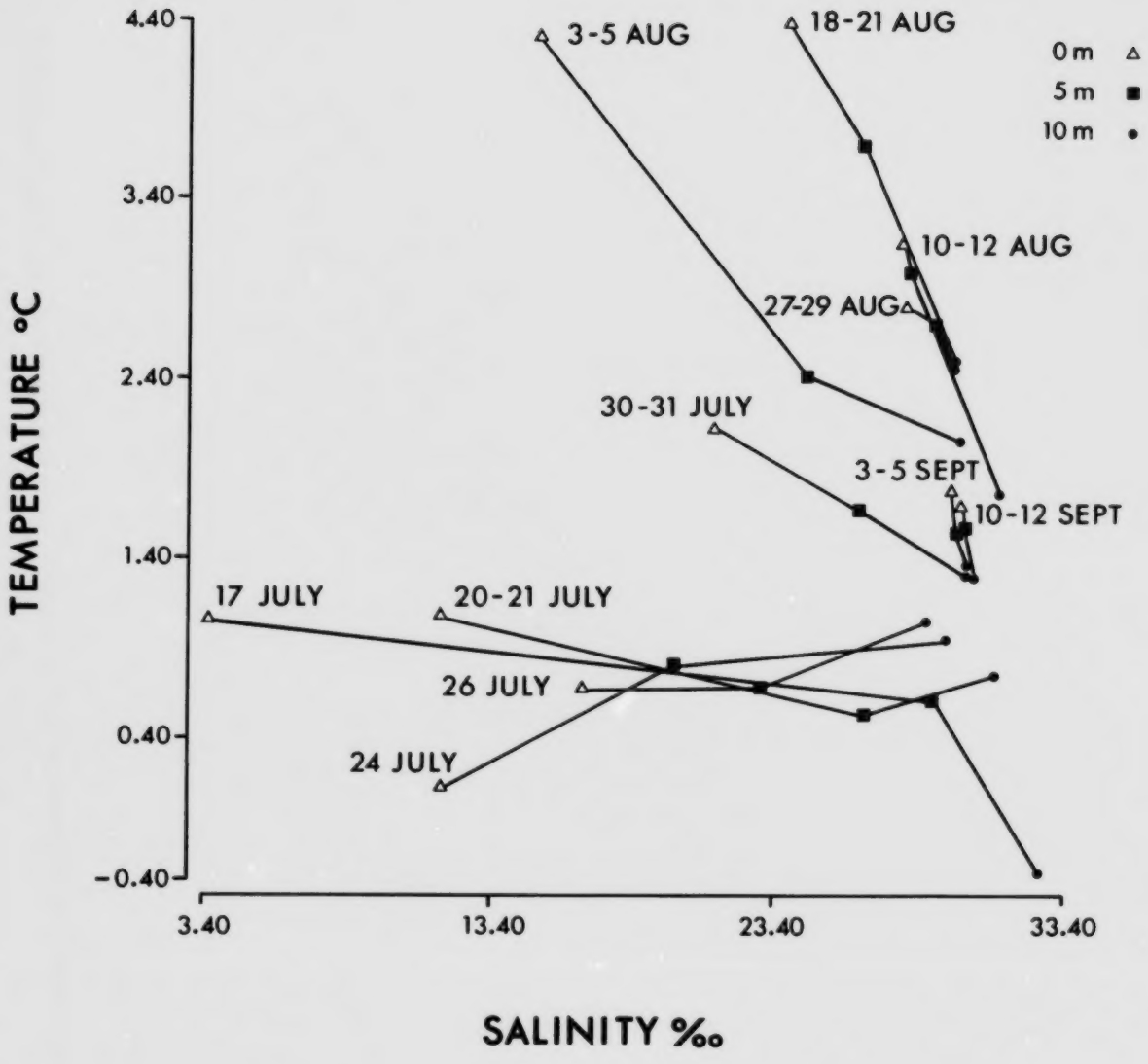


Figure 3. Temperature-salinity (TS) diagram of the 1981 field season. Results are means for all bays.

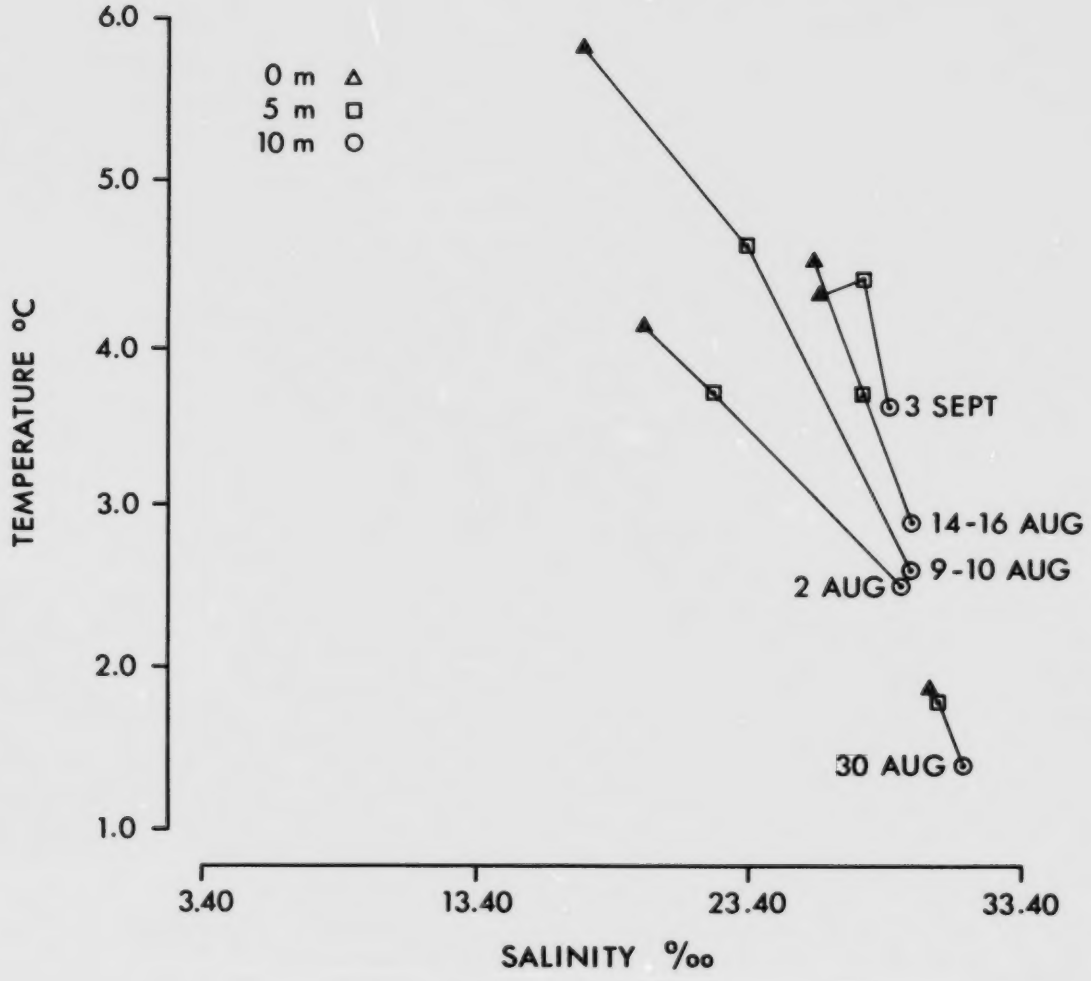


Figure 4. Temperature-salinity (TS) diagram of the 1982 field season. Results are means for all bays.

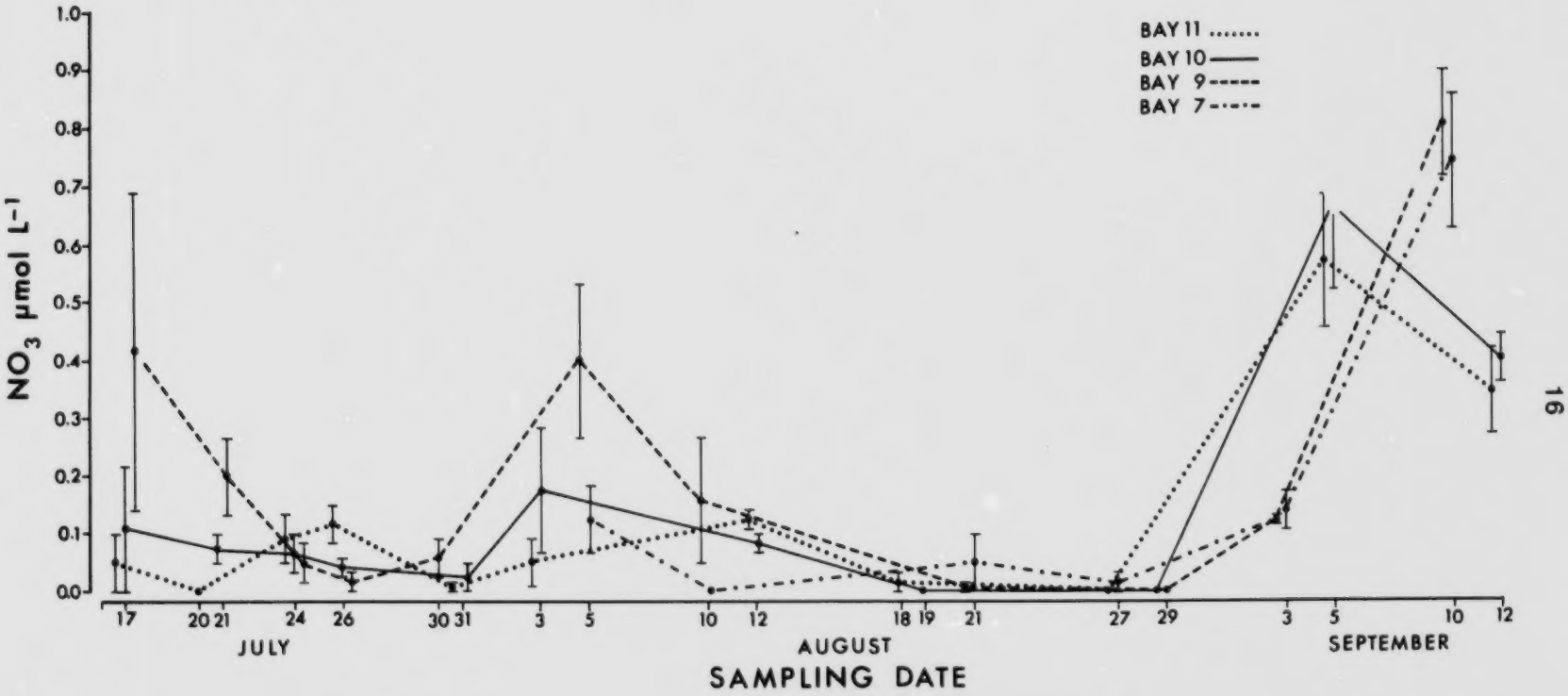


Figure 5. Concentrations of reactive nitrate ($NO_3$) determined from water samples collected in 1981. Results are presented as means and standard errors of six values from three depths at two stations in each bay.

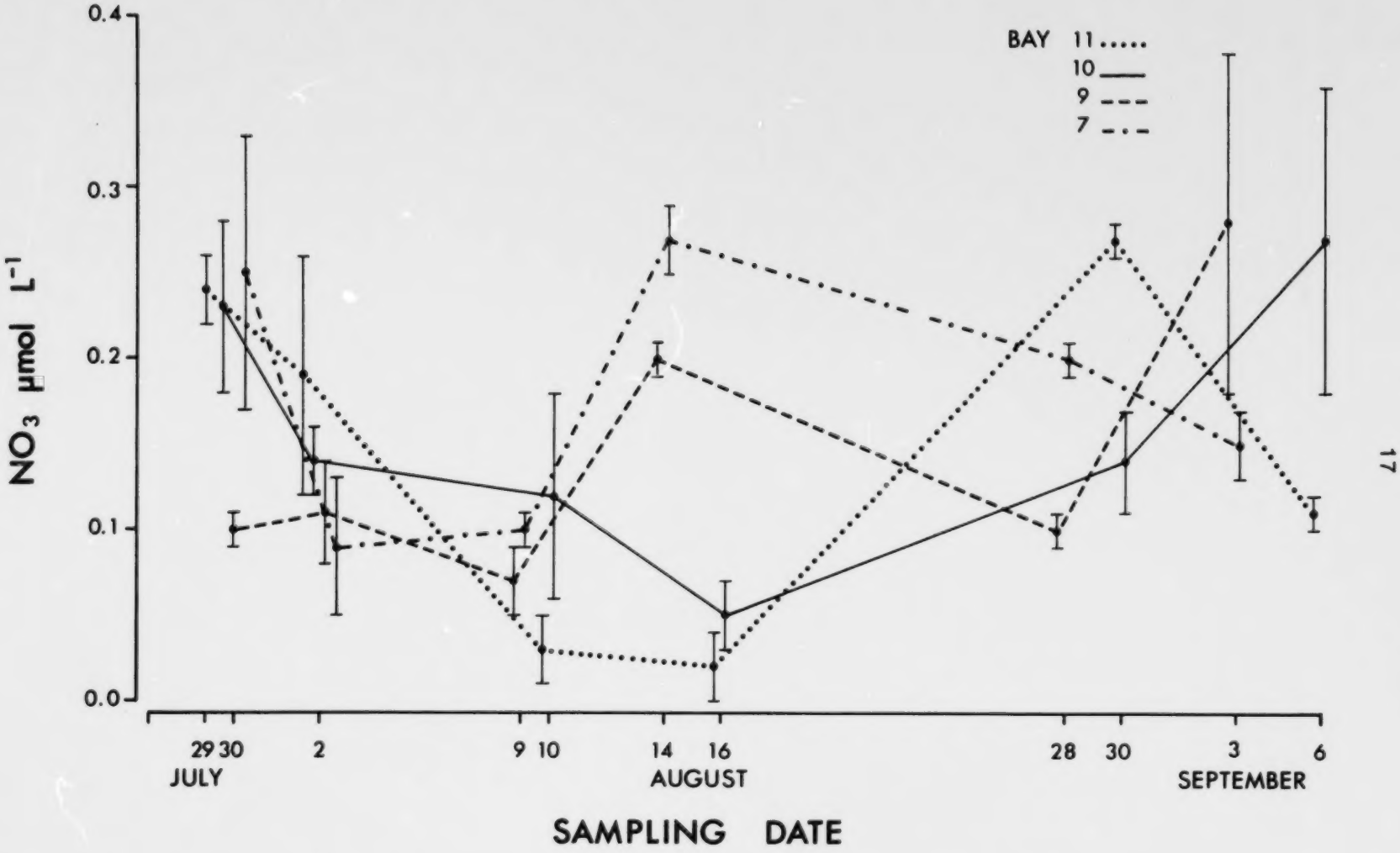


Figure 6. Concentrations of reactive nitrate ($NO_3$) determined from water samples collected in 1982. Results are presented as means and standard errors of six values from three depths at two stations in each bay.

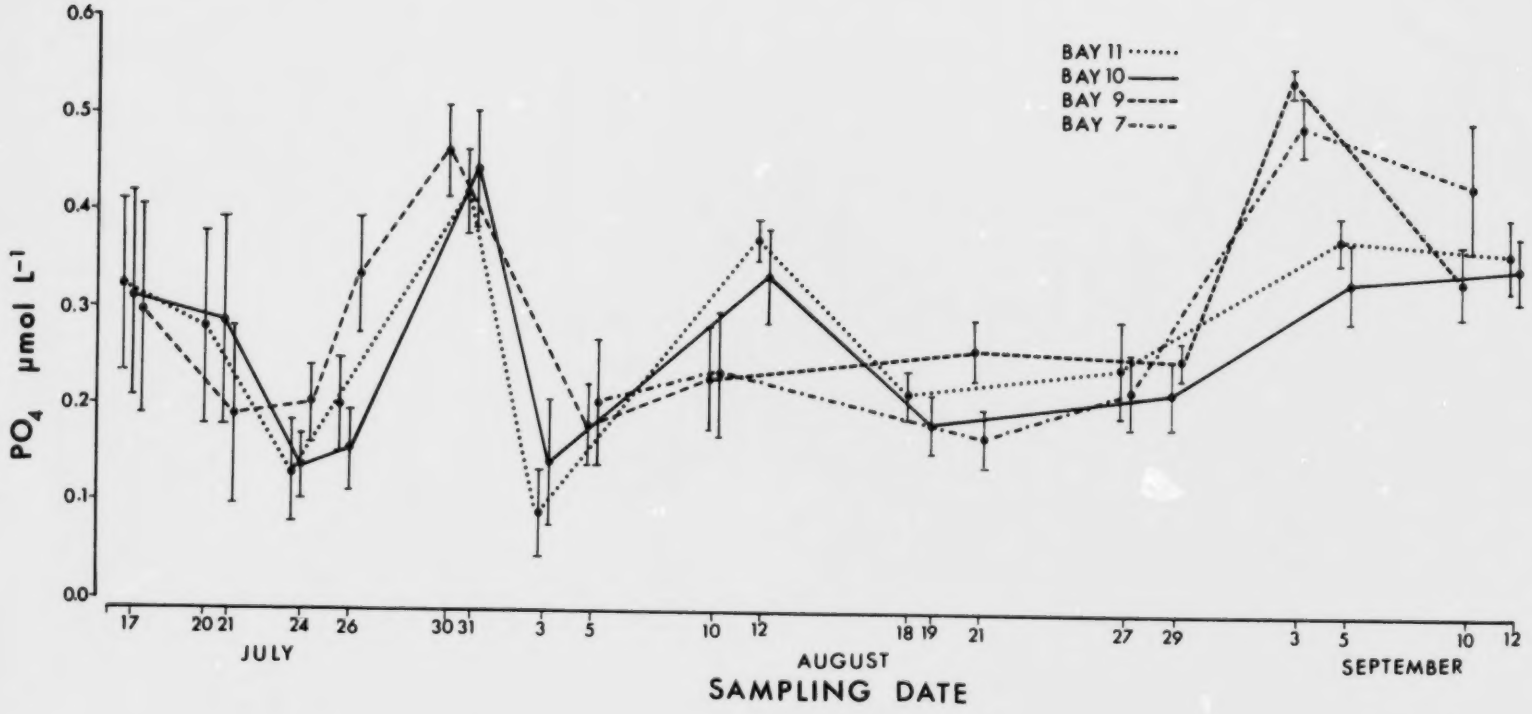


Figure 7. Concentrations of reactive phosphate ($PO_4$) determined from water samples collected in 1981. Results are presented as means and standard errors of six values from three depths at two stations in each bay.

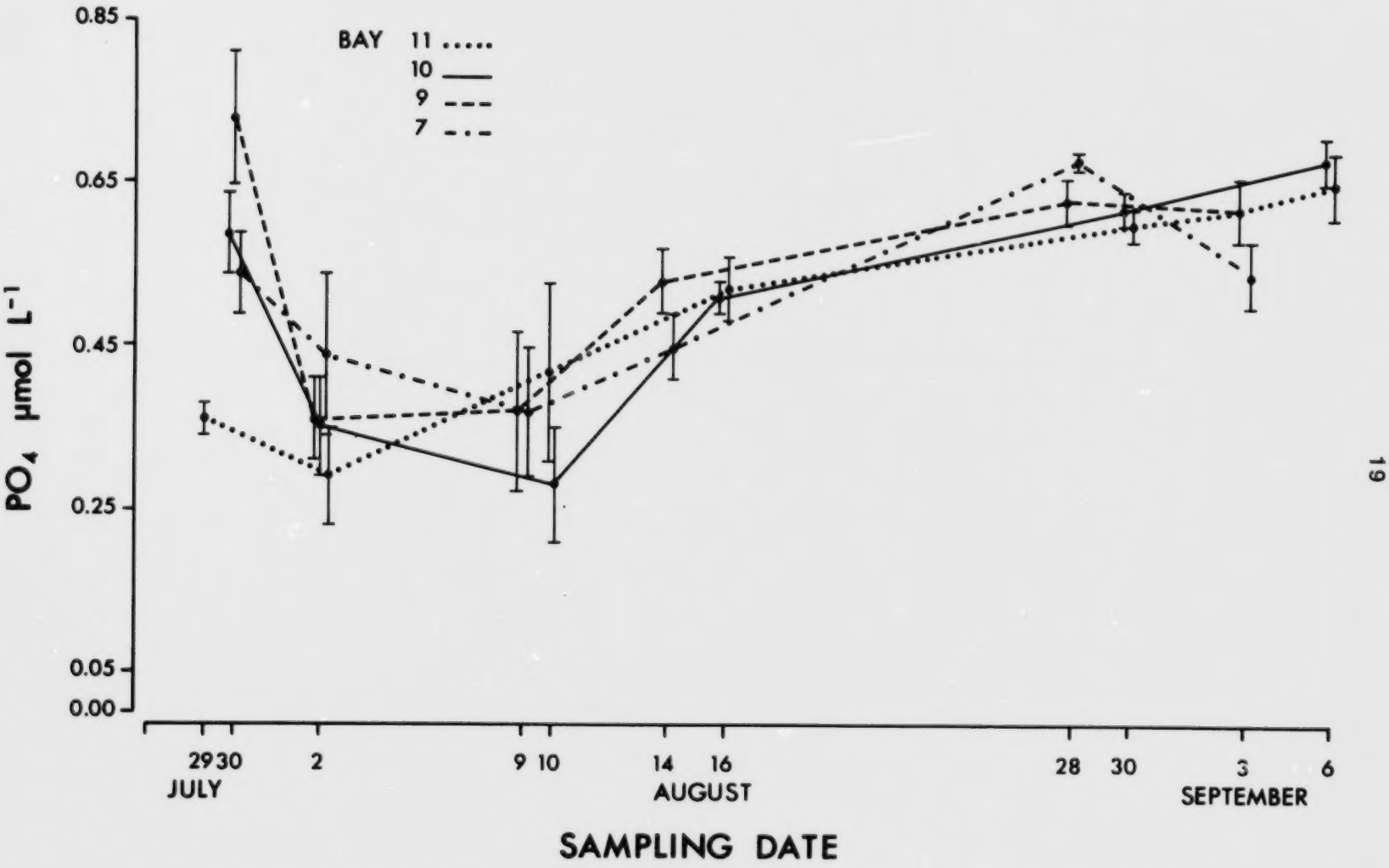


Figure 8. Concentrations of reactive phosphate ($PO_4$) determined from water samples collected in 1982. Results are presented as means and standard errors of six values from three depths at two stations in each bay.

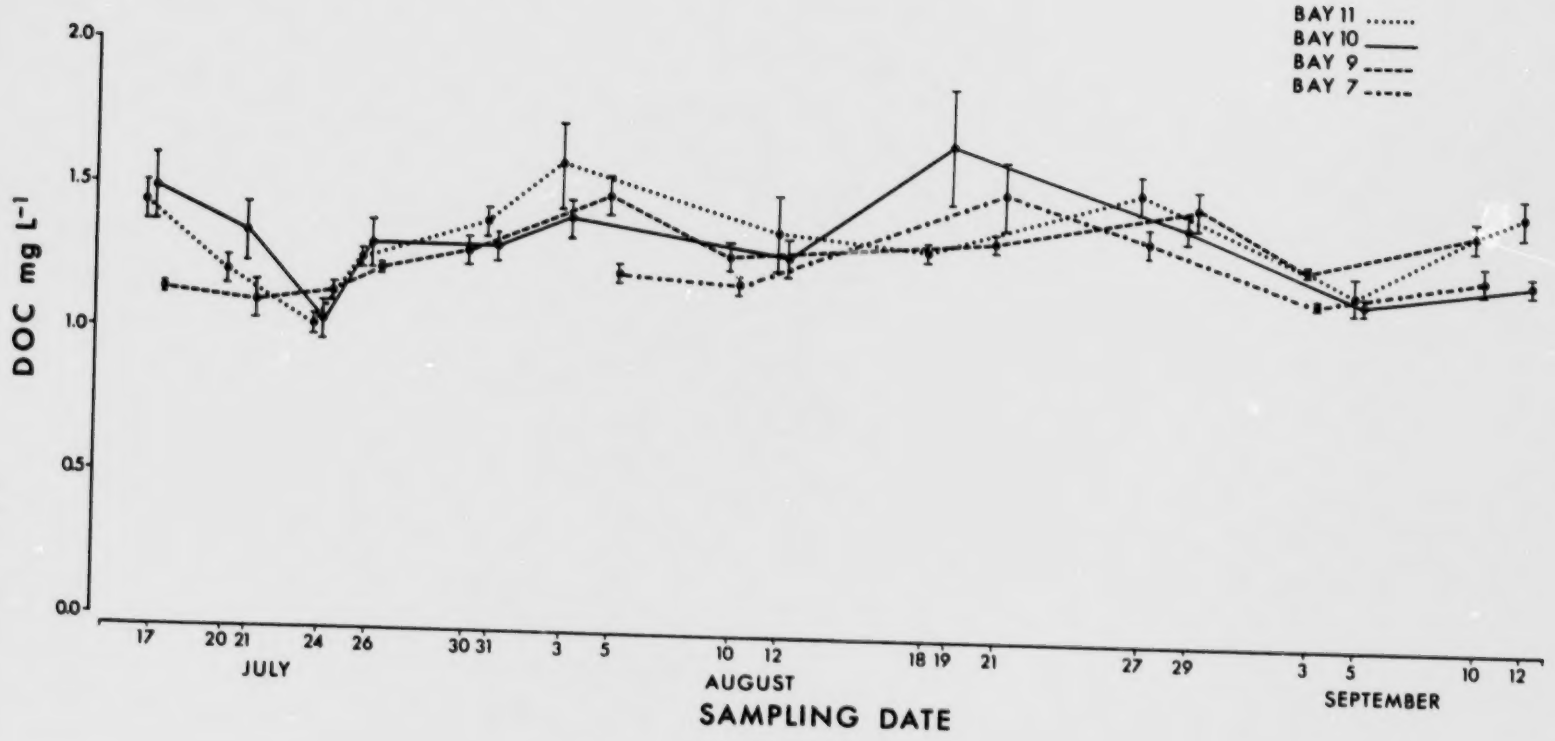


Figure 9. Concentrations of dissolved organic carbon (DOC) determined from water samples collected in 1981. Results are presented as means and standard errors of six values from three depths at two stations in each bay.

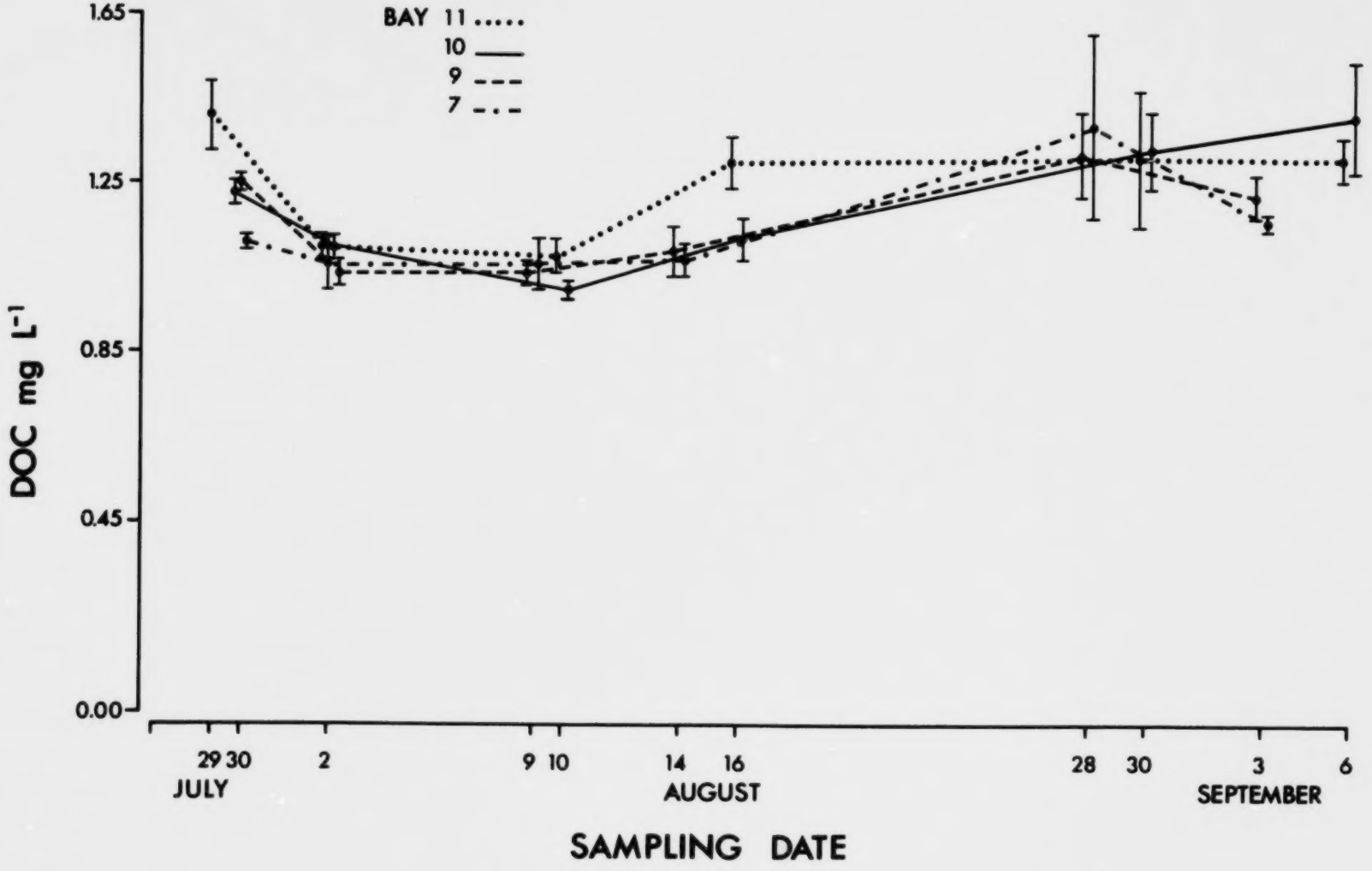


Figure 10. Concentrations of dissolved organic carbon (DOC) determined from water samples collected in 1982. Results are presented as means and standard errors of six values from three depths at two stations in each bay.

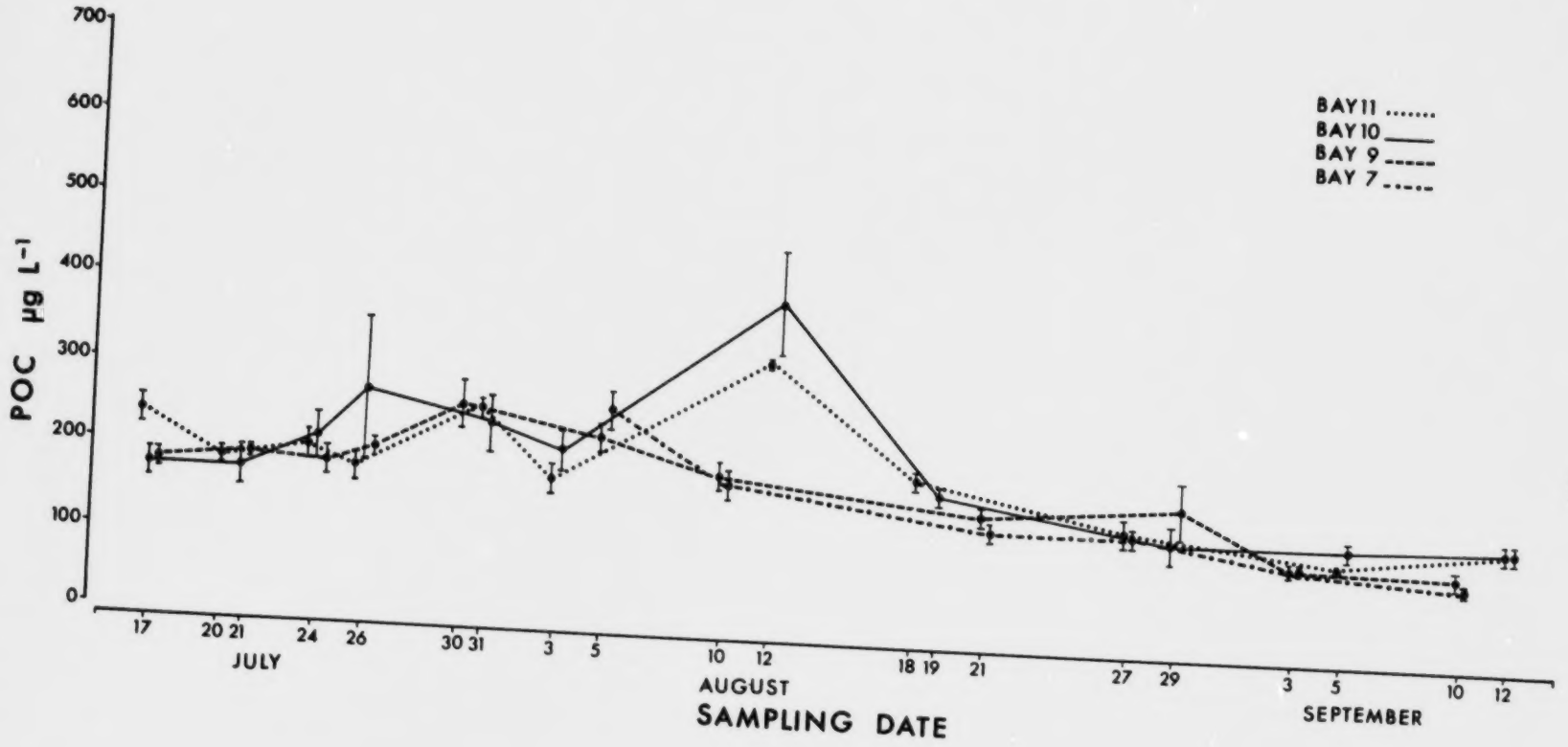


Figure 11. Concentrations of particulate organic carbon (POC) determined from water samples collected in 1981. Results are presented as means and standard errors of six values from three depths at two stations in each bay.

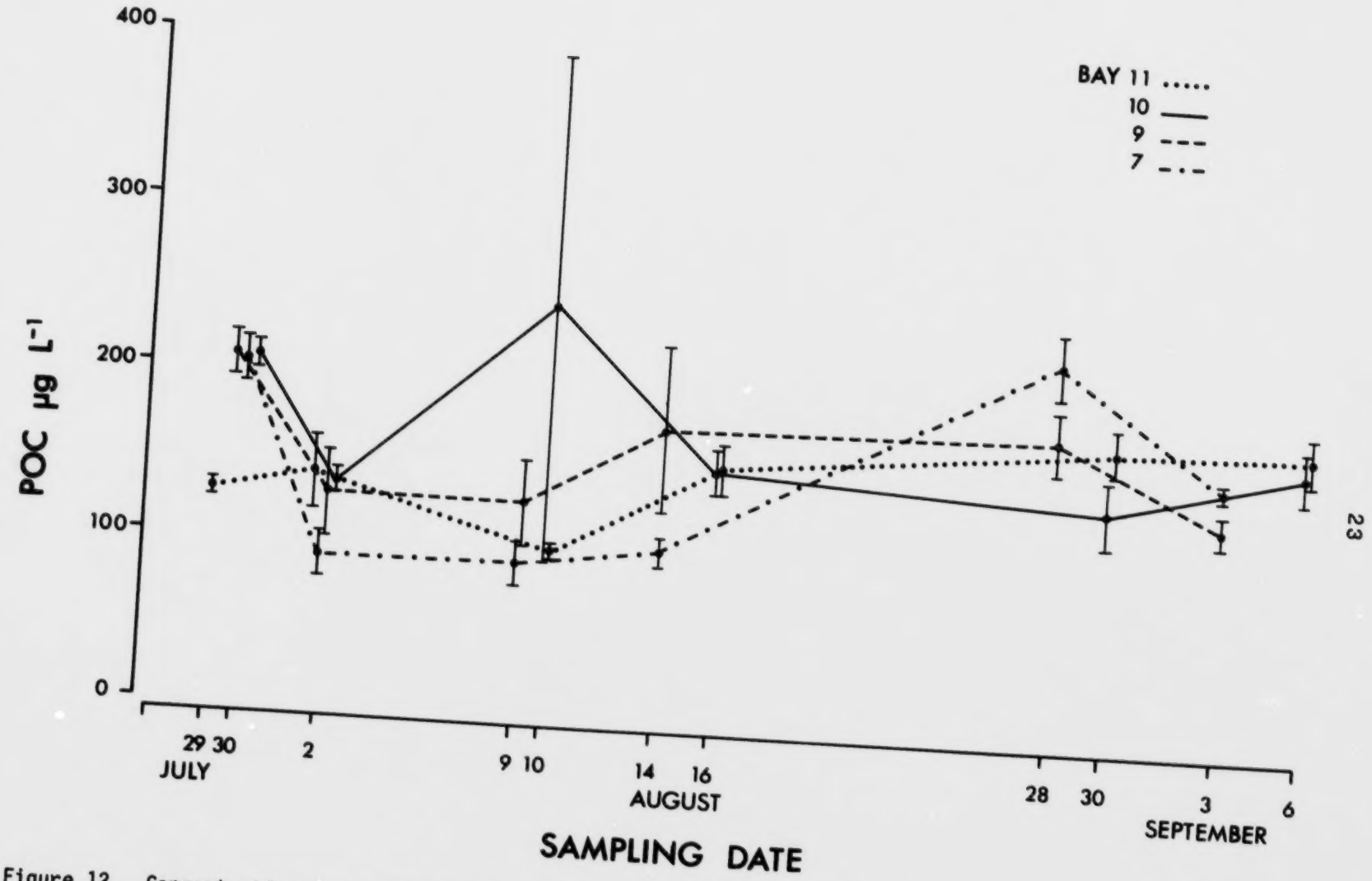


Figure 12. Concentrations of particulate organic carbon (POC) determined from water samples collected in 1982. Results are presented as means and standard errors of six values from three depths at two stations in each bay.

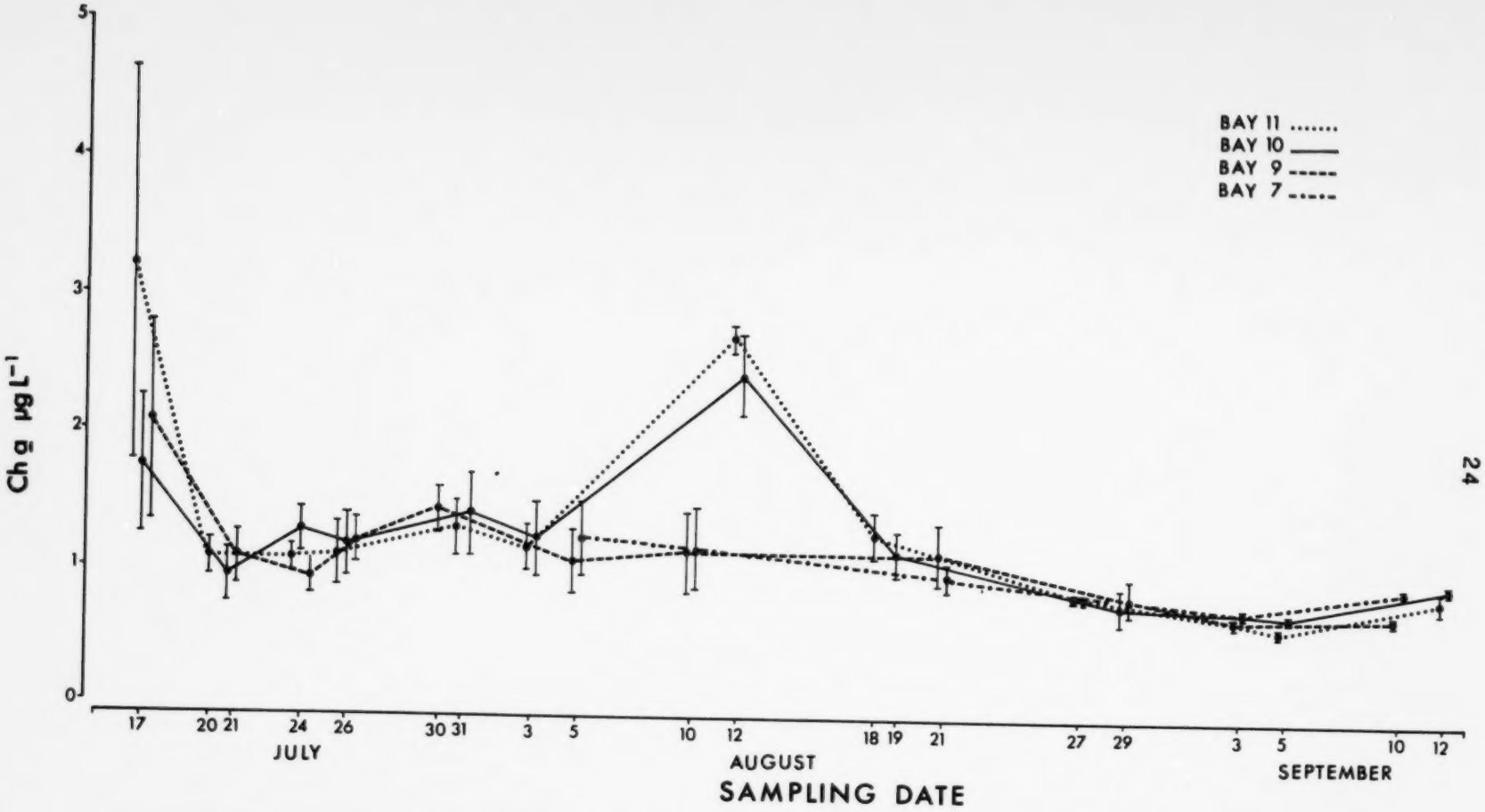


Figure 13. Concentrations of chlorophyll a (Ch a) determined from water samples collected in 1981. Results are presented as means and standard errors of six values from three depths at two stations in each bay.

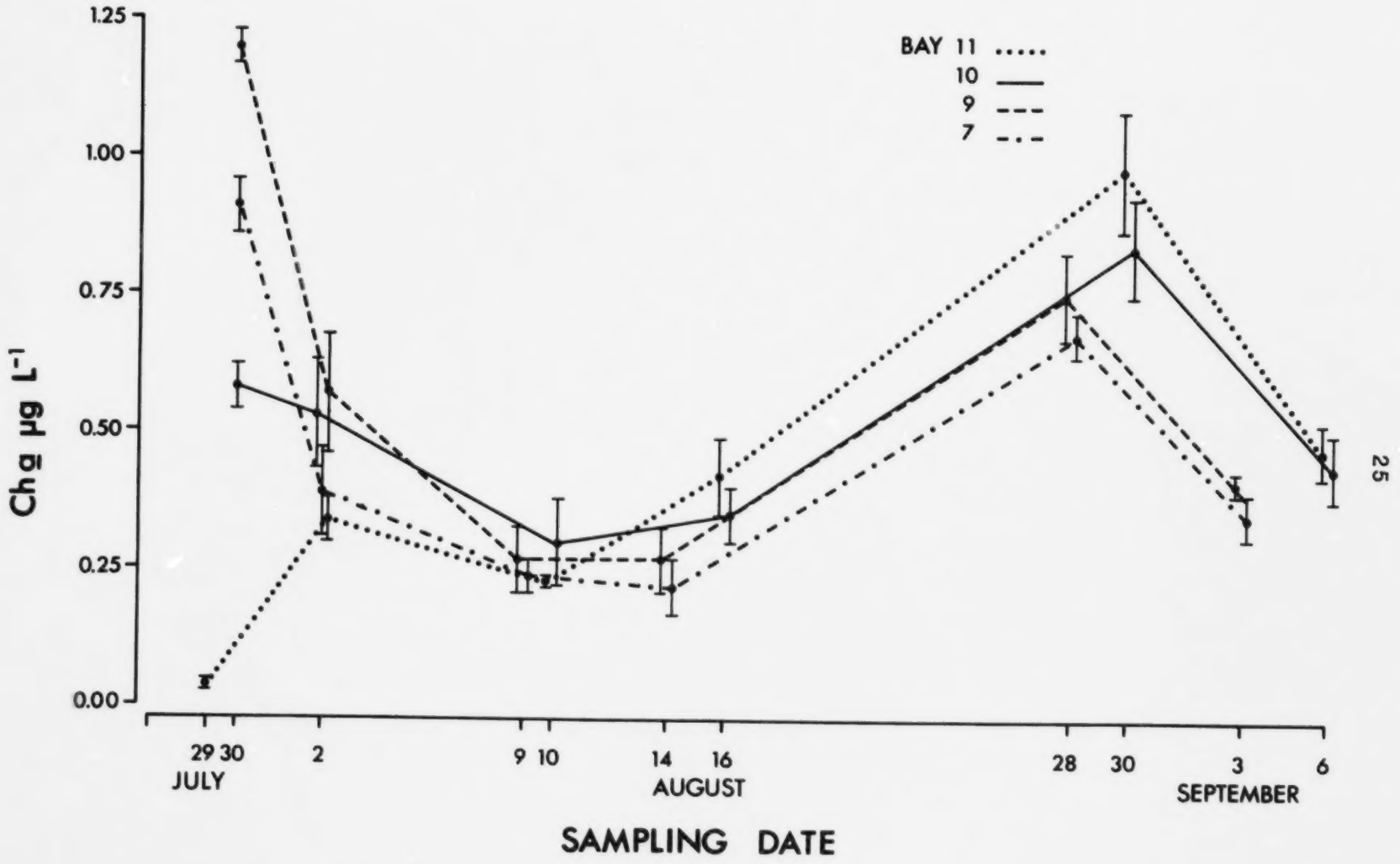


Figure 14. Concentrations of chlorophyll a (Ch a) determined from water samples collected in 1982. Results are presented as means and standard errors of six values from three depths at two stations in each bay.

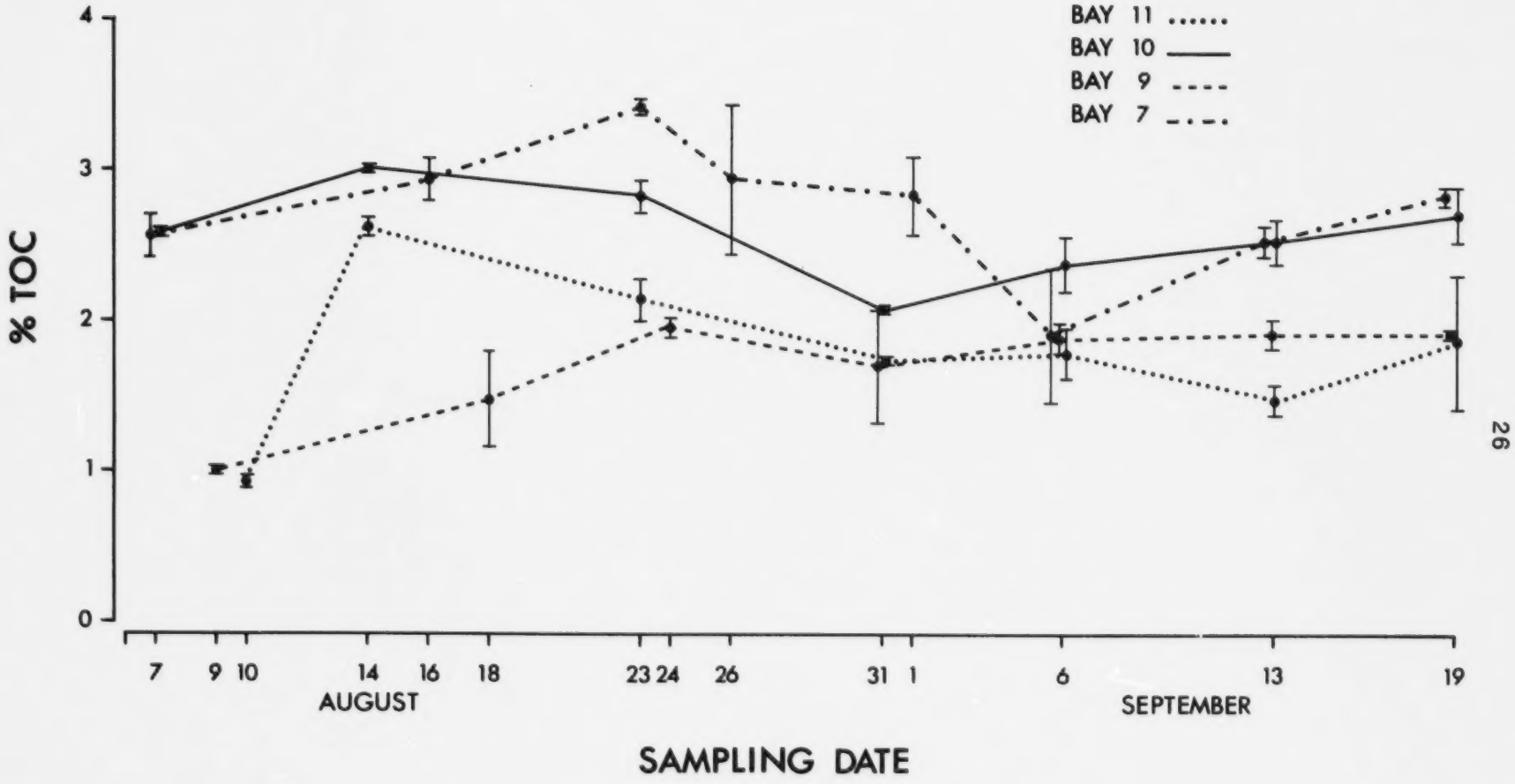


Figure 15. Percent total organic carbon (TOC) determined from homogenized sediment samples collected in 1981. Results are presented as means and standard errors of two values from two stations in each bay.

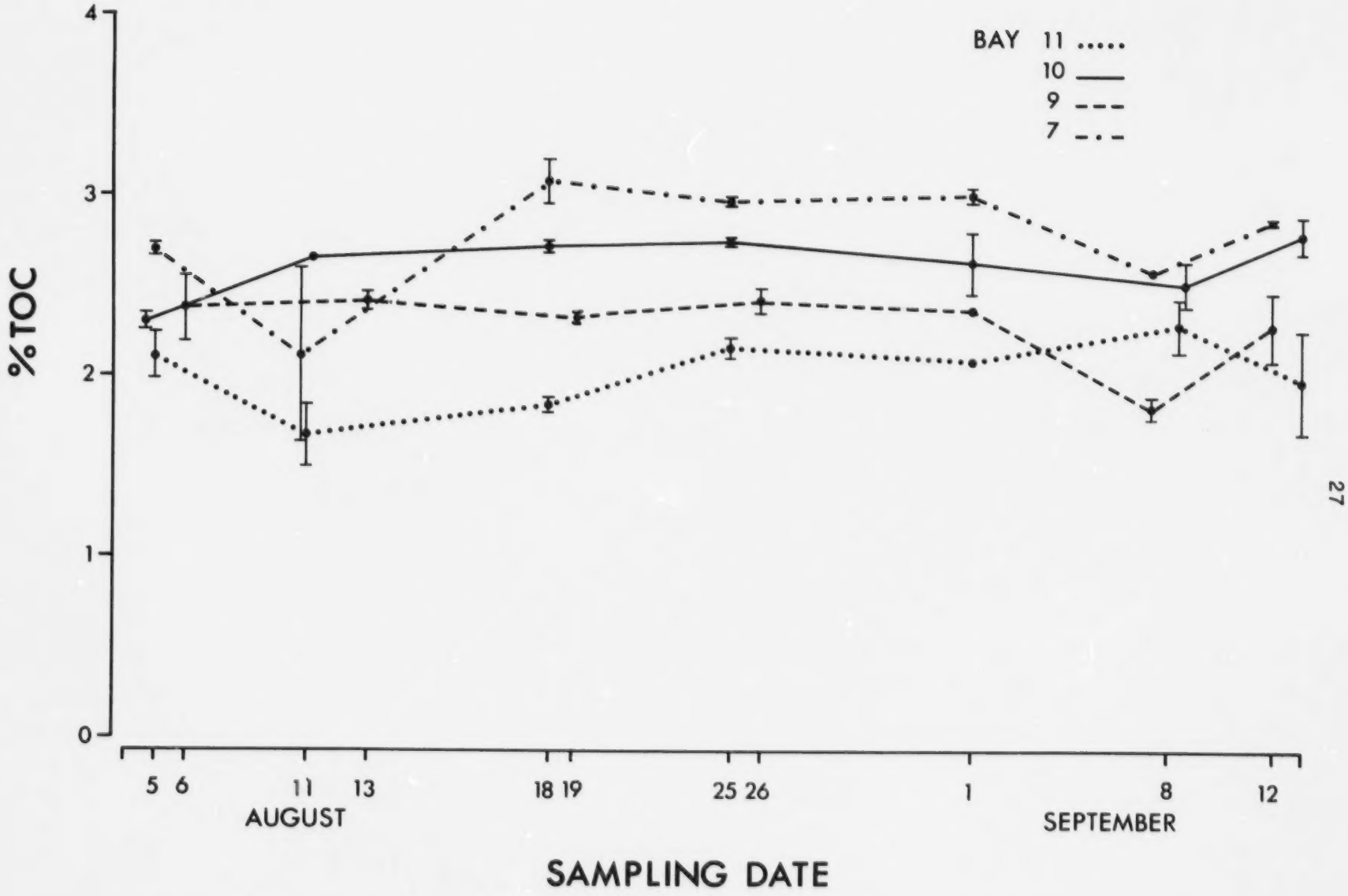


Figure 16. Percent total organic carbon (TOC) determined from homogenized sediment samples collected in 1982. Results are presented as means and standard errors of two values from two stations in each bay.

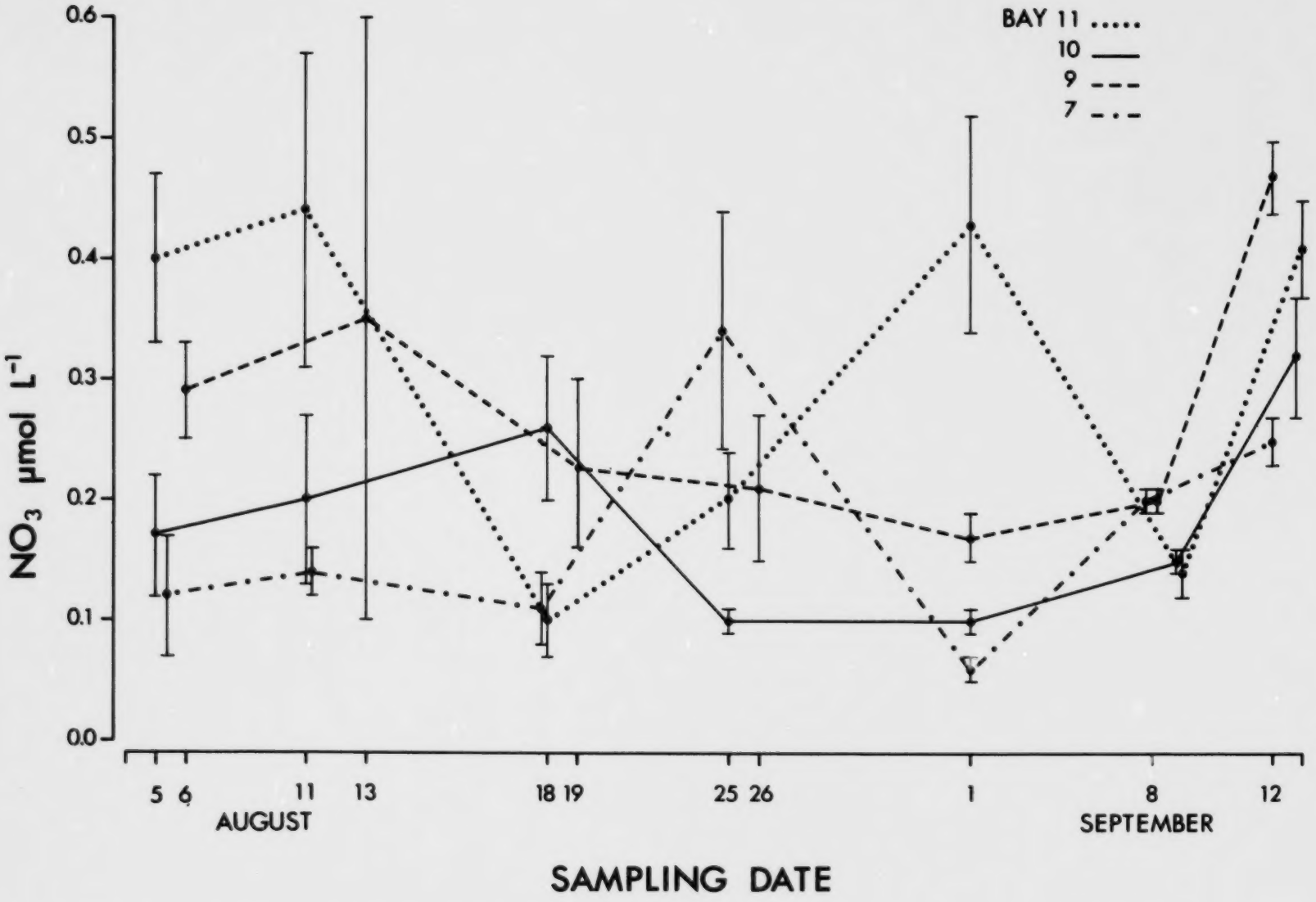


Figure 17. Concentrations of nitrate ($NO_3$) obtained from interstitial water collected in the sediments of four bays in 1982. Results are presented as means and standard errors of three samples from one station.

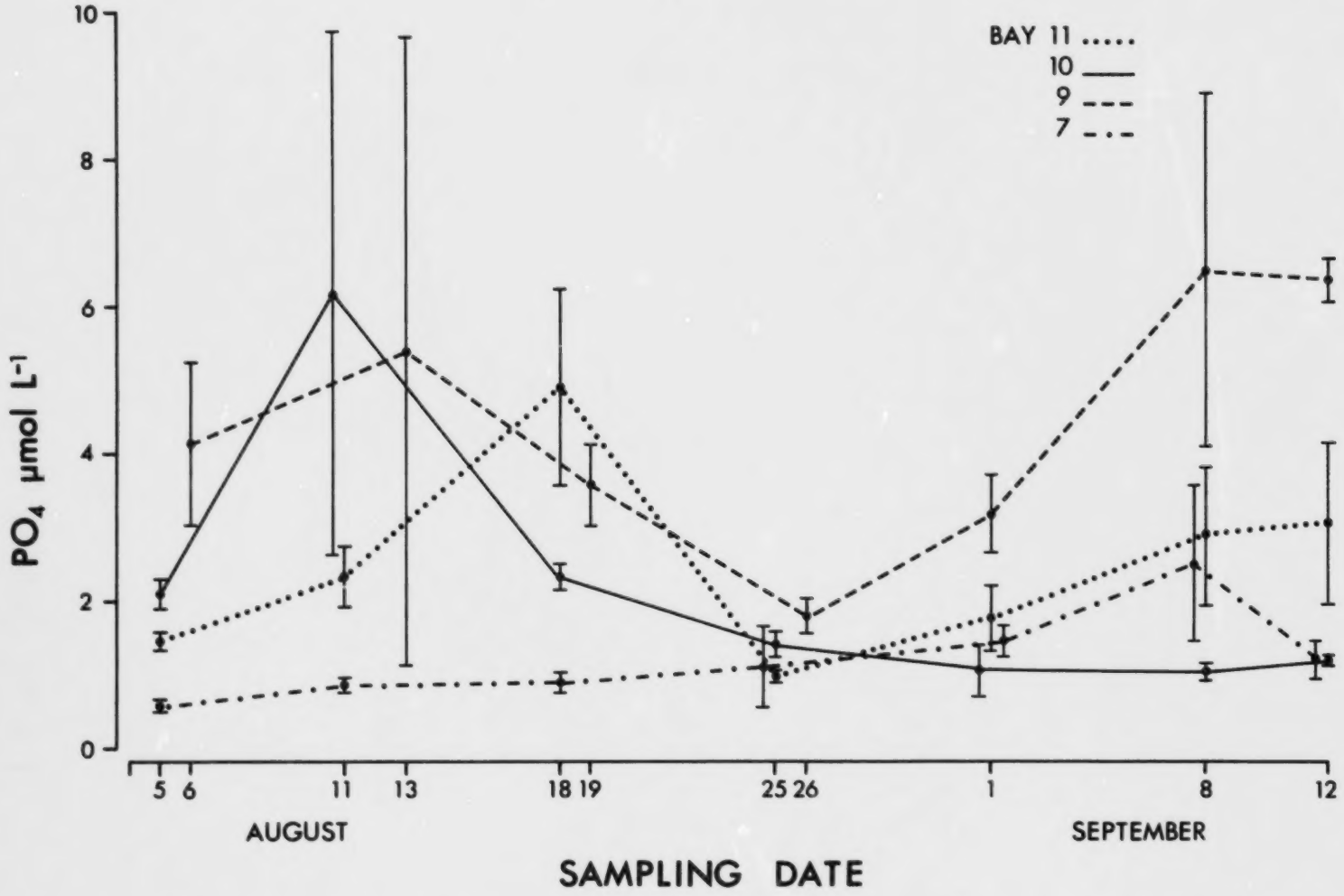


Figure 18. Concentrations of phosphate ($PO_4$) obtained from interstititial water collected in the sediments of the four bays in 1982. Results are presented as means and standard errors of three samples from one station.

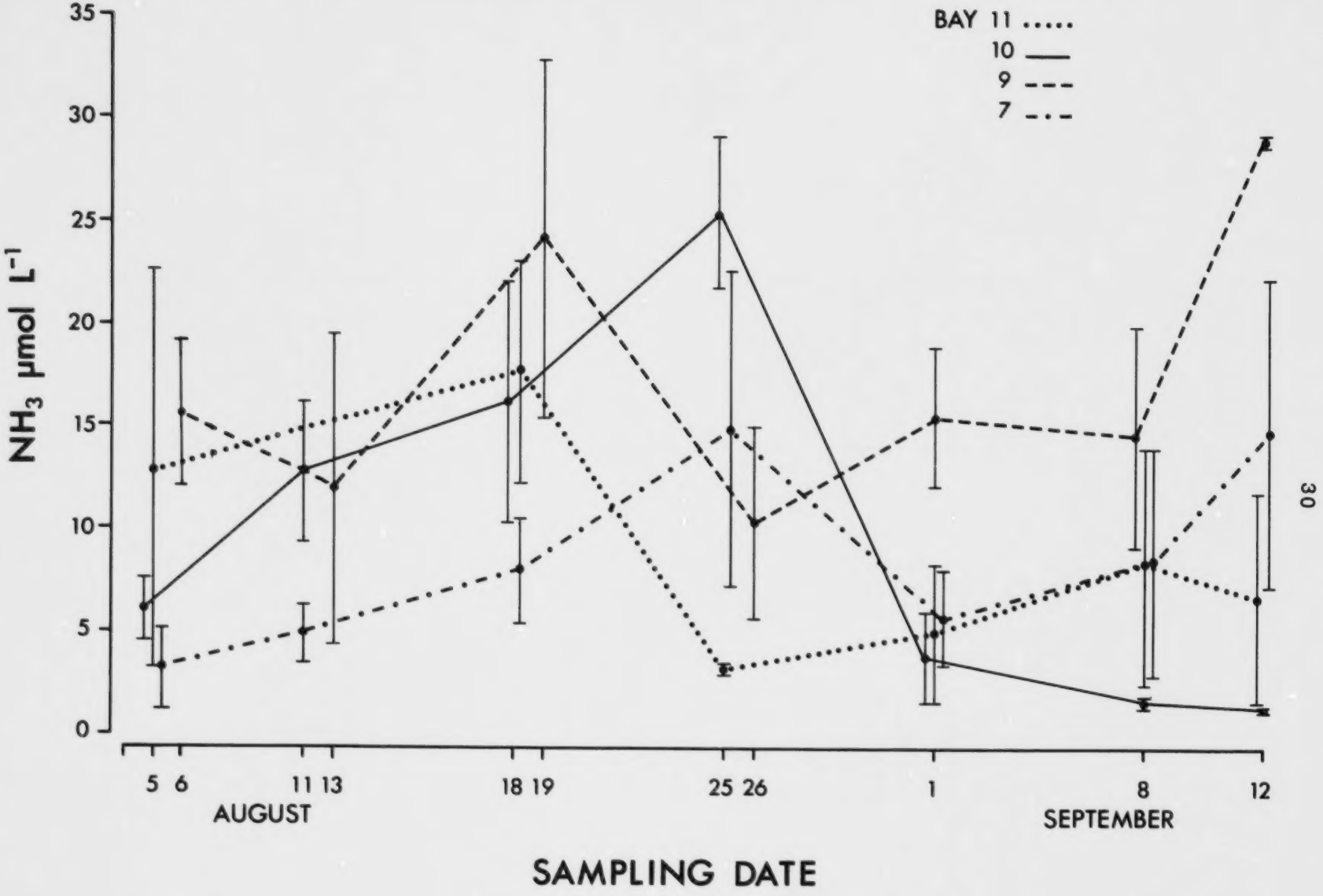


Figure 19. Concentrations of ammonia ($NH_3$) determined from interstitial water collected in the sediments of the four bays in 1982. Results are presented as means and standard errors of three samples from one station.

# 5.0 TABLES

Table 2. Water column stations occupied in 1981.

| Date | Bay | Stations |
|---|---|---|
| 07 17 | 11 | 1 2 |
| | 10 | 3 4 |
| | 9 | 5 6 |
| 07 20 | 11 | 1 2 |
| 07 21 | 10 | 3 4 |
| | 9 | 5 6 |
| 07 24 | 11 | 1 2 |
| | 10 | 3 4 |
| | 9 | 5 6 |
| 07 26 | 11 | 1 2 |
| | 10 | 3 4 |
| | 9 | 5 6 |
| 07 30 | 9 | 5 6 |
| 07 31 | 11 | 1 2 |
| | 10 | 3 4 |
| 08 03 | 11 | 1 2 |
| | 10 | 3 4 |
| 08 05 | 9 | 5 6 |
| | 7 | 7 8 |
| 08 10 | 9 | 5 6 |
| | 7 | 7 8 |
| 08 12 | 11 | 1 2 |
| | 10 | 3 4 |

Table 2. (Cont'd)

| Date | Bay | Stations |
|---|---|---|
| 08 18 | 11 | 1 2 |
| 08 19 | 10 | 3 4 |
| 08 21 | 9 | 5 6 |
| | 7 | 7 8 |
| 08 27 | 11 | 1 2 |
| | 7 | 7 8 |
| 08 29 | 10 | 3 4 |
| | 9 | 5 6 |
| 09 03 | 9 | 5 6 |
| | 7 | 7 8 |
| 09 05 | 11 | 1 2 |
| | 10 | 3 4 |
| 09 10 | 9 | 5 6 |
| | 7 | 7 8 |
| 09 12 | 11 | 1 2 |
| | 10 | 3 4 |

Table 3. Water column stations occupied in 1982.

| Date | Bay | Stations |
|---|---|---|
| 07 29 | 11 | 1 2 |
| 07 30 | 10 | 3 4 |
| | 9 | 5 6 |
| | 7 | 7 8 |
| 08 02 | 11 | 1 2 |
| | 10 | 3 4 |
| | 9 | 5 6 |
| | 7 | 7 8 |
| 08 10 | 11 | 1 2 |
| | 10 | 3 4 |
| 08 09 | 9 | 5 6 |
| | 7 | 7 8 |
| 08 16 | 11 | 1 2 |
| | 10 | 3 4 |
| 08 14 | 9 | 5 6 |
| | 7 | 7 8 |
| 08 30 | 11 | 1 2 |
| | 10 | 3 4 |
| 08 28 | 9 | 5 6 |
| | 7 | 7 8 |
| 09 06 | 11 | 1 2 |
| | 10 | 3 4 |
| 09 03 | 9 | 5 6 |
| | 7 | 7 8 |

Table 4. Determinations of temperature and salinity from water samples collected in 1981.

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 1 | 07 17 | 0 | 1.2 | 3.34 |
| | | 5 | 0.4 | 29.20 |
| | | 10 | -0.2 | 31.86 |
| 2 | 07 17 | 0 | 0.6 | 2.80 |
| | | 5 | 0.4 | 29.75 |
| | | 10 | -0.2 | 31.89 |
| 3 | 07 17 | 0 | 1.3 | 3.76 |
| | | 5 | 0.8 | 29.41 |
| | | 10 | -0.4 | 32.09 |
| 4 | 07 17 | 0 | 1.1 | 3.61 |
| | | 5 | 0.8 | 28.47 |
| | | 9 | -0.4 | 33.00 |
| 5 | 07 17 | 0 | 1.1 | 3.58 |
| | | 5 | 0.6 | 27.27 |
| | | 10 | -0.4 | 34.00 |
| 6 | 07 17 | 0 | 1.0 | 3.82 |
| | | 5 | 0.6 | 28.90 |
| | | 10 | -0.5 | 32.39 |
| 1 | 07 20 | 0 | 0.9 | 12.65 |
| | | 5 | 0.8 | 28.96 |
| | | 10 | 0.6 | 30.39 |

Table 4. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 2 | 07 20 | 0 | 0.7 | 11.49 |
| | | 5 | 0.9 | 29.58 |
| | | 10 | 1.7 | 30.92 |
| 3 | 07 21 | 0 | 1.7 | 12.79 |
| | | 5 | 0.7 | 25.14 |
| | | 9 | 0.5 | 31.04 |
| 4 | 07 21 | 0 | 1.8 | 13.00 |
| | | 5 | 0.4 | 27.43 |
| | | 10 | 0.4 | 31.39 |
| 5 | 07 21 | 0 | 0.8 | 10.24 |
| | | 5 | 0.2 | 23.52 |
| | | 10 | 0.7 | 30.92 |
| 6 | 07 21 | 0 | 0.5 | 9.52 |
| | | 5 | 0.2 | 23.60 |
| | | 9 | 0.5 | 30.43 |
| 1 | 07 24 | 0 | 0.0 | 10.41 |
| | | 5 | 1.0 | 18.56 |
| | | 10 | 1.0 | 29.66 |
| 2 | 07 24 | 0 | 0.3 | 11.23 |
| | | 5 | 0.9 | 20.78 |
| | | 10 | 1.0 | 29.24 |

Table 4. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 3 | 07 24 | 0 | -0.2 | 9.86 |
| | | 5 | 0.7 | 18.65 |
| | | 10 | 0.8 | 29.32 |
| 4 | 07 24 | 0 | -0.2 | 10.24 |
| | | 5 | 0.8 | 18.80 |
| | | 10 | 1.0 | 29.52 |
| 5 | 07 24 | 0 | 0.4 | 14.12 |
| | | 5 | 0.7 | 20.65 |
| | | 10 | 0.9 | 29.02 |
| 6 | 07 24 | 0 | 0.4 | 14.59 |
| | | 5 | 0.7 | 20.97 |
| | | 10 | 0.8 | 29.19 |
| 1 | 07 26 | 0 | 1.1 | 16.51 |
| | | 5 | 0.9 | 22.37 |
| | | 10 | 1.1 | 29.07 |
| 2 | 07 26 | 0 | 1.0 | 17.78 |
| | | 5 | 0.0 | 22.51 |
| | | 10 | 1.0 | 28.59 |
| 3 | 07 26 | 0 | 0.7 | 15.81 |
| | | 5 | 0.8 | 22.39 |
| | | 10 | 1.0 | 28.43 |

Table 4. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 4 | 07 26 | 0 | 0.9 | 15.68 |
| | | 5 | 0.8 | 22.47 |
| | | 10 | 1.1 | 28.87 |
| 5 | 07 26 | 0 | 0.3 | 16.35 |
| | | 5 | 0.8 | 23.76 |
| | | 10 | 1.0 | 27.22 |
| 6 | 07 26 | 0 | 0.0 | 16.63 |
| | | 5 | 0.8 | 23.32 |
| | | 10 | 1.0 | 28.51 |
| 1 | 07 31 | 0 | 2.4 | 19.54 |
| | | 5 | 1.9 | 25.04 |
| | | 10 | 1.4 | 29.28 |
| 2 | 07 31 | 0 | 2.3 | 19.38 |
| | | 5 | 1.7 | 25.85 |
| | | 10 | 1.4 | 29.50 |
| 3 | 07 31 | 0 | 2.3 | 19.50 |
| | | 5 | 1.8 | 25.78 |
| | | 10 | 1.5 | 29.54 |
| 4 | 07 31 | 0 | 2.2 | 19.52 |
| | | 5 | 1.6 | 27.02 |
| | | 10 | 1.4 | 29.55 |

Table 4. (Cont'd)

| Station | Date | Depth | Temp. | Salinity |
|---|---|---|---|---|
| | | m | °C | °/.. |
| 5 | 07 30 | 0 | 1.7 | 25.05 |
| | | 5 | 1.5 | 27.40 |
| | | 10 | 1.0 | 31.24 |
| 6 | 07 30 | 0 | 1.8 | 23.84 |
| | | 5 | 1.6 | 26.61 |
| | | 10 | 1.1 | 30.82 |
| 1 | 08 03 | 0 | 3.7 | 14.59 |
| | | 5 | 2.4 | 22.39 |
| | | 10 | 1.6 | 30.23 |
| 2 | 08 03 | 0 | 4.1 | 14.46 |
| | | 5 | 2.5 | 22.98 |
| | | 10 | 1.5 | 30.68 |
| 3 | 08 03 | 0 | 4.0 | 15.28 |
| | | 5 | 2.5 | -- |
| | | 10 | 1.7 | -- |
| 4 | 08 03 | 0 | 3.8 | 14.24 |
| | | 5 | 2.6 | 21.90 |
| | | 10 | 1.8 | 29.61 |
| 5 | 08 05 | 0 | 4.7 | 16.08 |
| | | 5 | 2.7 | 25.98 |
| | | 10 | 1.4 | 29.93 |

Table 4. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 6 | 08 05 | 0 | 4.8 | 16.04 |
| | | 5 | 2.5 | 24.28 |
| | | 10 | 2.3 | 27.05 |
| 7 | 08 05 | 0 | 4.3 | 16.53 |
| | | 5 | 2.1 | 26.55 |
| | | 10 | 4.6 | 30.10 |
| 8 | 08 05 | 0 | 5.0 | 13.09 |
| | | 5 | 2.0 | 26.34 |
| | | 10 | 1.5 | 30.25 |
| 1 | 08 12 | 0 | 1.9 | 31.26 |
| | | 5 | 1.8 | 31.30 |
| | | 10 | 1.6 | 31.51 |
| 2 | 08 12 | 0 | 1.9 | 31.18 |
| | | 5 | 1.8 | 31.31 |
| | | 10 | 1.6 | 31.52 |
| 3 | 08 12 | 0 | 2.2 | 30.77 |
| | | 5 | 2.1 | 30.77 |
| | | 10 | 1.8 | 31.16 |
| 4 | 08 12 | 0 | 2.2 | 30.61 |
| | | 5 | 2.0 | 30.72 |
| | | 10 | 1.8 | 31.28 |

Table 4. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 5 | 08 10 | 0 | 4.1 | 23.90 |
| | | 5 | 4.0 | 24.04 |
| | | 10 | 1.8 | 30.64 |
| 6 | 08 10 | 0 | 4.1 | 23.93 |
| | | 5 | 4.1 | 24.09 |
| | | 10 | 1.7 | 30.83 |
| 7 | 08 10 | 0 | 4.5 | 22.67 |
| | | 5 | 3.9 | -- |
| | | 10 | 1.8 | 30.99 |
| 8 | 08 10 | 0 | 4.4 | -- |
| | | 5 | 4.1 | 23.91 |
| | | 10 | 1.9 | 30.77 |
| 1 | 08 18 | 0 | 4.5 | 23.65 |
| | | 5 | 4.0 | 25.69 |
| | | 10 | 2.5 | 29.38 |
| 2 | 08 18 | 0 | 4.4 | 20.80 |
| | | 5 | 3.8 | 26.14 |
| | | 10 | 2.6 | 29.21 |
| 3 | 08 19 | 0 | 4.5 | 23.19 |
| | | 5 | 4.2 | 24.71 |
| | | 10 | 2.9 | 28.37 |

Table 4. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 4 | 08 19 | 0 | 4.9 | 23.26 |
| | | 5 | 4.0 | 24.95 |
| | | 10 | 3.0 | 28.52 |
| 5 | 08 21 | 0 | 3.9 | 25.63 |
| | | 5 | 3.2 | 28.05 |
| | | 10 | 2.0 | 30.31 |
| 6 | 08 21 | 0 | 4.2 | 25.48 |
| | | 5 | 3.4 | 27.58 |
| | | 10 | 2.3 | 30.24 |
| 7 | 08 21 | 0 | 4.3 | 23.95 |
| | | 5 | 3.5 | 27.09 |
| | | 10 | 2.2 | 30.03 |
| 8 | 08 21 | 0 | 4.3 | 24.16 |
| | | 5 | 3.4 | 27.38 |
| | | 10 | 2.4 | 29.55 |
| 1 | 08 27 | 0 | 2.6 | 29.05 |
| | | 5 | 2.4 | 29.59 |
| | | 10 | 2.0 | 30.44 |
| 2 | 08 27 | 0 | 2.7 | 28.91 |
| | | 5 | 2.6 | 29.47 |
| | | 10 | 2.1 | 30.35 |

Table 4. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 3 | 08 29 | 0 | 2.6 | 27.42 |
| | | 5 | 2.6 | -- |
| | | 10 | 2.4 | 29.54 |
| 4 | 08 29 | 0 | 2.7 | 27.46 |
| | | 5 | 2.7 | -- |
| | | 10 | 2.5 | 29.47 |
| 5 | 08 29 | 0 | 2.7 | 27.51 |
| | | 5 | 2.7 | 28.63 |
| | | 10 | 2.4 | 29.52 |
| 6 | 08 29 | 0 | 2.8 | 27.52 |
| | | 5 | 2.8 | 28.65 |
| | | 10 | 2.5 | 29.42 |
| 7 | 08 27 | 0 | 3.0 | 28.11 |
| | | 5 | 2.9 | -- |
| | | 10 | 2.8 | 28.66 |
| 8 | 08 27 | 0 | 3.0 | 27.45 |
| | | 5 | 2.8 | 28.48 |
| | | 10 | 2.8 | 28.73 |
| 1 | 09 05 | 0 | 1.6 | 29.48 |
| | | 5 | 1.2 | 29.80 |
| | | 10 | 0.9 | 30.50 |

Table 4. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 2 | 09 05 | 0 | 1.5 | 29.59 |
| | | 5 | 1.2 | 29.97 |
| | | 10 | 0.9 | 30.82 |
| 3 | 09 05 | 0 | 1.5 | 29.52 |
| | | 5 | 1.3 | 29.76 |
| | | 10 | 1.1 | 29.99 |
| 4 | 09 05 | 0 | 1.3 | 29.87 |
| | | 5 | 0.9 | 30.63 |
| | | 10 | 0.8 | 30.78 |
| 5 | 09 03 | 0 | 2.2 | 28.79 |
| | | 5 | 2.1 | 28.82 |
| | | 10 | 2.0 | 28.93 |
| 6 | 09 03 | 0 | 2.1 | -- |
| | | 5 | 2.0 | 28.94 |
| | | 10 | 2.0 | 28.99 |
| 7 | 09 03 | 0 | 2.0 | -- |
| | | 5 | 1.8 | 29.13 |
| | | 10 | 1.7 | 29.35 |
| 8 | 09 03 | 0 | 1.9 | -- |
| | | 5 | 1.8 | 29.29 |
| | | 10 | 1.5 | 29.64 |

Table 4. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 1 | 09 12 | 0 | 2.0 | 28.93 |
| | | 5 | 1.8 | 29.54 |
| | | 10 | 1.6 | 29.97 |
| 2 | 09 12 | 0 | 2.1 | -- |
| | | 5 | 1.9 | 29.55 |
| | | 10 | 1.5 | 29.98 |
| 3 | 09 12 | 0 | 1.9 | 29.19 |
| | | 5 | 1.9 | 29.37 |
| | | 10 | 1.6 | 29.79 |
| 4 | 09 12 | 0 | 1.9 | 29.22 |
| | | 5 | 1.9 | 29.28 |
| | | 10 | 1.6 | 29.71 |
| 5 | 09 10 | 0 | -- | 30.22 |
| | | 5 | 1.1 | 30.40 |
| | | 10 | 0.9 | 30.61 |
| 6 | 09 10 | 0 | 1.3 | 30.61 |
| | | 5 | 1.1 | 30.39 |
| | | 10 | 0.9 | 30.74 |
| 7 | 09 10 | 0 | 1.3 | 30.01 |
| | | 5 | 1.3 | 30.11 |
| | | 10 | 1.1 | 30.48 |
| 8 | 09 10 | 0 | 1.1 | 30.53 |
| | | 5 | 1.4 | 30.12 |
| | | 10 | 1.0 | 30.83 |

Table 5. Determinations of temperature and salinity from water samples collected in 1982.

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 1 | 07 29 | 0 | 2.0 | 26.42 |
| | | 5 | 2.0 | 27.80 |
| | | 10 | 1.5 | 30.24 |
| 2 | 07 29 | 0 | 1.9 | 27.11 |
| | | 5 | 1.9 | 27.96 |
| | | 10 | 1.4 | 30.25 |
| 3 | 07 30 | 0 | 1.6 | 31.44 |
| | | 5 | 1.6 | 31.53 |
| | | 10 | 1.4 | 31.75 |
| 4 | 07 30 | 0 | 1.6 | 31.44 |
| | | 5 | 1.6 | 31.50 |
| | | 10 | 1.1 | 31.86 |
| 5 | 07 30 | 0 | 1.7 | 31.31 |
| | | 5 | 1.4 | 31.53 |
| | | 10 | 1.3 | 31.70 |
| 6 | 07 30 | 0 | 1.7 | 31.23 |
| | | 5 | 1.5 | 31.53 |
| | | 10 | 1.3 | 31.67 |
| 7 | 07 30 | 0 | 2.1 | 30.57 |
| | | 5 | 2.2 | 30.61 |
| | | 10 | 1.9 | 31.05 |
| 8 | 07 30 | 0 | 2.2 | 30.53 |
| | | 5 | 2.2 | 30.59 |
| | | 10 | 1.4 | 31.78 |

Table 5. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 1 | 08 02 | 0 | 4.3 | 19.90 |
| | | 5 | 3.8 | 21.76 |
| | | 10 | 2.8 | 29.12 |
| 2 | 08 02 | 0 | 4.2 | 19.92 |
| | | 5 | 3.8 | 22.28 |
| | | 10 | 2.6 | 29.42 |
| 3 | 08 02 | 0 | 4.0 | 19.98 |
| | | 5 | 3.9 | 21.36 |
| | | 10 | 3.4 | 25.59 |
| 4 | 08 02 | 0 | 4.1 | 19.84 |
| | | 5 | 3.2 | 21.59 |
| | | 10 | 2.6 | 30.25 |
| 5 | 08 02 | 0 | 4.1 | 19.97 |
| | | 5 | 3.7 | 23.01 |
| | | 10 | 2.5 | 29.83 |
| 6 | 08 02 | 0 | 4.0 | 20.09 |
| | | 5 | 3.8 | 21.83 |
| | | 10 | 2.1 | 29.70 |
| 7 | 08 02 | 0 | 4.0 | 18.11 |
| | | 5 | 3.6 | 21.95 |
| | | 10 | 2.0 | 29.46 |
| 8 | 08 02 | 0 | 4.0 | 17.97 |
| | | 5 | 3.5 | 23.28 |
| | | 10 | 2.1 | 29.16 |

Table 5. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 1 | 08 10 | 0 | 5.1 | 19.20 |
| | | 5 | 4.9 | 21.15 |
| | | 10 | 2.4 | 29.56 |
| 2 | 08 10 | 0 | 5.2 | 19.02 |
| | | 5 | 5.0 | 21.20 |
| | | 10 | 2.6 | 28.92 |
| 3 | 08 10 | 0 | 5.5 | 18.03 |
| | | 5 | 5.0 | 20.63 |
| | | 10 | 2.4 | 30.04 |
| 4 | 08 10 | 0 | 5.5 | 18.22 |
| | | 5 | 4.8 | 21.77 |
| | | 10 | 2.4 | 29.79 |
| 5 | 08 09 | 0 | 6.3 | 16.08 |
| | | 5 | 4.2 | 25.31 |
| | | 10 | 2.9 | 28.92 |
| 6 | 08 09 | 0 | 6.2 | 16.18 |
| | | 5 | 4.0 | 25.59 |
| | | 10 | 2.8 | 29.58 |
| 7 | 08 09 | 0 | 6.2 | 16.07 |
| | | 5 | 3.9 | 25.51 |
| | | 10 | 2.8 | 28.88 |
| 8 | 08 09 | 0 | 6.2 | 16.08 |
| | | 5 | 4.6 | 25.06 |
| | | 10 | 2.8 | 28.98 |

Table 5. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 1 | 08 16 | 0 | 4.5 | 26.42 |
| | | 5 | 3.8 | 27.93 |
| | | 10 | 2.8 | 29.65 |
| 2 | 08 16 | 0 | 4.4 | 26.43 |
| | | 5 | 3.8 | 27.78 |
| | | 10 | 2.7 | 29.72 |
| 3 | 08 16 | 0 | 4.5 | 26.43 |
| | | 5 | 3.8 | 27.84 |
| | | 10 | 2.8 | 29.68 |
| 4 | 08 16 | 0 | 4.6 | 26.21 |
| | | 5 | 4.0 | 27.56 |
| | | 10 | 2.9 | 29.61 |
| 5 | 08 14 | 0 | 4.4 | 25.10 |
| | | 5 | 3.4 | 27.34 |
| | | 10 | 2.8 | 29.55 |
| 6 | 08 14 | 0 | 4.4 | 25.02 |
| | | 5 | 3.6 | 27.15 |
| | | 10 | 2.8 | 29.30 |
| 7 | 08 14 | 0 | 4.4 | 25.22 |
| | | 5 | 3.7 | 27.50 |
| | | 10 | 3.1 | 28.84 |
| 8 | 08 14 | 0 | 4.4 | 25.21 |
| | | 5 | 3.7 | 26.78 |
| | | 10 | 3.1 | 28.69 |

Table 5. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 1 | 08 30 | 0 | -- | 28.48 |
| | | 5 | -- | 28.84 |
| | | 9 | -- | 29.16 |
| 2 | 08 30 | 0 | -- | 28.52 |
| | | 5 | -- | 28.77 |
| | | 10 | -- | 29.14 |
| 3 | 08 30 | 0 | -- | 28.53 |
| | | 5 | -- | 28.68 |
| | | 10 | -- | 29.30 |
| 4 | 08 30 | 0 | 5.2 | 28.48 |
| | | 5 | 6.3 | 28.65 |
| | | 10 | 5.6 | 29.18 |
| 5 | 08 28 | 0 | -- | 28.07 |
| | | 5 | -- | 28.38 |
| | | 10 | -- | 29.08 |
| 6 | 08 28 | 0 | -- | 28.08 |
| | | 5 | -- | 28.21 |
| | | 10 | -- | 29.00 |
| 7 | 08 28 | 0 | -- | 28.03 |
| | | 5 | -- | 28.16 |
| | | 8 | -- | 28.53 |
| 8 | 08 28 | 0 | -- | 28.04 |
| | | 5 | -- | 28.16 |
| | | 9 | -- | 28.58 |

Table 5. (Cont'd)

| Station | Date | Depth m | Temp. °C | Salinity °/.. |
|---|---|---|---|---|
| 1 | 09 06 | 0 | -- | 27.86 |
| | | 5 | -- | 28.22 |
| | | 9 | -- | 29.81 |
| 2 | 09 06 | 0 | -- | 27.82 |
| | | 5 | -- | 28.27 |
| | | 8 | -- | 30.13 |
| 3 | 09 06 | 0 | -- | 27.70 |
| | | 5 | -- | 27.83 |
| | | 8 | -- | 29.87 |
| 4 | 09 06 | 0 | -- | 27.69 |
| | | 5 | -- | 27.59 |
| | | 8 | -- | 29.41 |
| 5 | 09 03 | 0 | 4.4 | 26.19 |
| | | 5 | 4.5 | 27.59 |
| | | 8 | 3.2 | 29.39 |
| 6 | 09 03 | 0 | 4.3 | 26.08 |
| | | 5 | 4.4 | 27.31 |
| | | 8 | 3.8 | 29.14 |
| 7 | 09 03 | 0 | 4.3 | 25.90 |
| | | 5 | 4.2 | 27.94 |
| | | 8 | 3.7 | 26.49 |
| 8 | 09 03 | 0 | 4.3 | 25.85 |
| | | 5 | 4.4 | 27.66 |
| | | 8 | 3.6 | 28.94 |

Table 6. Concentrations of reactive nitrate ($NO_3$), reactive phosphate ($PO_4$), dissolved organic carbon (DOC), particulate organic carbon (POC) and chlorophyll *a* (Ch *a*) from water samples collected in 1981.

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch *a* |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 1 | 07 17 | 0 | 0.29 | 0.11 | 1.25 | 266 | 10.16 |
| | | 5 | 0.00 | 0.42 | 1.44 | 161 | 1.27 |
| | | 10 | 0.00 | 0.56 | 1.39 | 253 | 2.17 |
| 2 | 07 17 | 0 | 0.00 | 0.00 | 1.31 | 243 | 0.91 |
| | | 5 | 0.00 | 0.40 | 1.61 | 237 | 1.99 |
| | | 10 | 0.00 | 0.45 | 1.66 | 258 | 2.74 |
| 3 | 07 17 | 0 | 0.00 | 0.00 | 1.32 | 249 | 0.50 |
| | | 5 | 0.00 | 0.39 | 1.72 | 157 | 1.45 |
| | | 10 | 0.00 | 0.54 | 1.74 | 185 | 3.56 |
| 4 | 07 17 | 0 | 0.00 | 0.00 | 1.27 | 140 | 0.65 |
| | | 5 | 0.00 | 0.36 | 1.70 | 152 | 1.30 |
| | | 9 | 0.64 | 0.59 | 1.11 | 145 | 2.85 |
| 5 | 07 17 | 0 | 0.00 | 0.00 | 1.13 | 158 | 0.45 |
| | | 5 | 0.00 | 0.43 | 1.14 | 187 | 1.33 |
| | | 10 | 0.97 | 0.68 | 1.15 | 194 | 3.78 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 6 | 07 17 | 0 | 0.00 | 0.00 | 1.12 | 156 | 0.54 |
| | | 5 | 0.00 | 0.37 | 1.13 | 207 | 1.61 |
| | | 10 | 1.53 | 0.31 | 1.08 | 152 | 4.69 |
| 1 | 07 20 | 0 | 0.00 | 0.04 | 1.04 | 157 | 0.93 |
| | | 5 | 0.00 | 0.27 | 1.24 | 180 | 1.06 |
| | | 10 | 0.00 | 0.67 | 1.20 | 212 | 1.33 |
| 2 | 07 20 | 0 | 0.00 | 0.00 | 1.09 | 154 | 0.49 |
| | | 5 | 0.00 | 0.29 | 1.42 | 213 | 1.24 |
| | | 10 | 0.00 | 0.41 | 1.21 | 180 | 1.34 |
| 3 | 07 21 | 0 | 0.00 | 0.00 | 1.05 | 123 | 0.38 |
| | | 5 | 0.11 | 0.15 | 1.33 | 159 | 0.98 |
| | | 9 | 0.09 | 0.43 | 1.79 | 267 | 1.47 |
| 4 | 07 21 | 0 | 0.00 | 0.04 | 1.30 | 136 | 0.32 |
| | | 5 | 0.18 | 0.45 | 1.28 | 208 | 1.16 |
| | | 10 | 0.09 | 0.66 | 1.26 | 144 | 1.32 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 5 | 07 21 | 0 | 0.00 | 0.00 | 1.18 | 194 | 0.63 |
| | | 5 | 0.34 | 0.12 | 1.32 | 162 | 0.88 |
| | | 10 | 0.34 | -- | 1.06 | 172 | 1.80 |
| 6 | 07 21 | 0 | 0.00 | 0.03 | 0.89 | 215 | 0.61 |
| | | 5 | 0.27 | 0.30 | 1.01 | 180 | 0.85 |
| | | 9 | 0.23 | 0.50 | 1.11 | 200 | 1.65 |
| 1 | 07 24 | 0 | 0.00 | 0.00 | 0.92 | 255 | 1.11 |
| | | 5 | 0.00 | 0.05 | 0.97 | 165 | 0.73 |
| | | 10 | 0.23 | 0.32 | 1.05 | 229 | 1.24 |
| 2 | 07 24 | 0 | 0.00 | 0.04 | 0.93 | 195 | 0.88 |
| | | 5 | 0.14 | 0.14 | 1.14 | 173 | 0.90 |
| | | 10 | 0.20 | 0.25 | 1.08 | 181 | 1.49 |
| 3 | 07 24 | 0 | 0.00 | 0.09 | 0.85 | 304 | 1.80 |
| | | 5 | 0.12 | 0.15 | 1.02 | 149 | 0.83 |
| | | 10 | 0.18 | 0.27 | 0.96 | 192 | 1.31 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 4 | 07 24 | 0 | 0.00 | 0.03 | 0.88 | 312 | 1.55 |
| | | 5 | 0.00 | 0.10 | 1.20 | 152 | 0.76 |
| | | 10 | 0.09 | 0.18 | 1.24 | 182 | 1.40 |
| 5 | 07 24 | 0 | 0.00 | 0.12 | 1.06 | 203 | 0.77 |
| | | 5 | 0.10 | 0.11 | 1.15 | 176 | 0.79 |
| | | 10 | 0.00 | 0.37 | 1.27 | 255 | 1.27 |
| 6 | 07 24 | 0 | 0.00 | 0.16 | 1.02 | 177 | 0.51 |
| | | 5 | 0.18 | 0.26 | 1.14 | 142 | 0.87 |
| | | 10 | 0.00 | 0.20 | 1.12 | 152 | 1.28 |
| 1 | 07 26 | 0 | 0.11 | 0.09 | 1.26 | 166 | 0.56 |
| | | 5 | 0.16 | 0.30 | 1.19 | 153 | 1.12 |
| | | 10 | 0.00 | 0.36 | 1.19 | 212 | 1.73 |
| 2 | 07 26 | 0 | 0.13 | 0.09 | 1.18 | 159 | 0.48 |
| | | 5 | 0.23 | 0.12 | 1.42 | 159 | 0.98 |
| | | 10 | 0.06 | 0.24 | 1.26 | 236 | 1.77 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 3 | 07 26 | 0 | 0.07 | 0.11 | 1.15 | 156 | 0.53 |
| | | 5 | 0.10 | 0.10 | 1.29 | 686 | 1.04 |
| | | 10 | 0.09 | 0.32 | 1.73 | 230 | 1.84 |
| 4 | 07 26 | 0 | 0.00 | 0.05 | 1.07 | 176 | 0.59 |
| | | 5 | 0.00 | 0.11 | 1.19 | 154 | 1.12 |
| | | 10 | 0.00 | 0.24 | 1.36 | 222 | 1.82 |
| 5 | 07 26 | 0 | 0.00 | 0.21 | 1.14 | 182 | 0.65 |
| | | 5 | 0.00 | 0.37 | 1.19 | 183 | 1.33 |
| | | 10 | 0.00 | 0.47 | 1.22 | 201 | 1.59 |
| 6 | 07 26 | 0 | 0.12 | 0.12 | 1.27 | 258 | 0.76 |
| | | 5 | 0.00 | 0.33 | 1.19 | 176 | 1.14 |
| | | 10 | 0.00 | 0.51 | 1.24 | 208 | 1.74 |
| 1 | 07 31 | 0 | 0.07 | 0.35 | 1.33 | 288 | 0.76 |
| | | 5 | 0.00 | 0.38 | 1.51 | 260 | 1.29 |
| | | 10 | 0.00 | 0.46 | 1.45 | 271 | 1.98 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 2 | 07 31 | 0 | 0.00 | 0.31 | 1.19 | 247 | 0.68 |
| | | 5 | 0.00 | 0.42 | 1.52 | 246 | 1.47 |
| | | 10 | 0.00 | 0.61 | 1.36 | 219 | 1.64 |
| 3 | 07 31 | 0 | 0.00 | 0.26 | 1.31 | 144 | 0.47 |
| | | 5 | 0.00 | 0.49 | 1.46 | 224 | 1.49 |
| | | 10 | 0.00 | 0.59 | 1.26 | 248 | 2.12 |
| 4 | 07 31 | 0 | 0.16 | 0.26 | 1.10 | 126 | 0.52 |
| | | 5 | 0.00 | 0.49 | 1.29 | 325 | 1.62 |
| | | 10 | 0.00 | 0.58 | 1.37 | 341 | 2.26 |
| 5 | 07 30 | 0 | 0.08 | 0.42 | 1.09 | 180 | 1.10 |
| | | 5 | 0.21 | 0.38 | 1.22 | 352 | 1.43 |
| | | 10 | 0.00 | 0.59 | 1.40 | 258 | 2.02 |
| 6 | 07 30 | 0 | 0.08 | 0.33 | 1.27 | 220 | 1.01 |
| | | 5 | 0.00 | 0.44 | 1.36 | 217 | 1.21 |
| | | 10 | 0.00 | 0.62 | 1.41 | 320 | 1.79 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 1 | 08 03 | 0 | 0.08 | 0.00 | 1.40 | 130 | 0.75 |
| | | 5 | 0.00 | 0.06 | 1.18 | 225 | 1.03 |
| | | 10 | 0.00 | 0.17 | 1.58 | 182 | 1.51 |
| 2 | 08 03 | 0 | 0.23 | 0.00 | 1.31 | 116 | 0.73 |
| | | 5 | 0.00 | 0.04 | 2.20 | 217 | 1.17 |
| | | 10 | 0.00 | 0.27 | 1.84 | 176 | 1.77 |
| 3 | 08 03 | 0 | 0.08 | 0.00 | 1.18 | 143 | 0.54 |
| | | 5 | 0.00 | 0.14 | 1.38 | 237 | 1.16 |
| | | 10 | 0.00 | 0.27 | 1.55 | 251 | 2.22 |
| 4 | 08 03 | 0 | 0.32 | 0.00 | 1.29 | 252 | 0.70 |
| | | 5 | 0.65 | 0.06 | 1.66 | 226 | 1.12 |
| | | 10 | 0.00 | 0.39 | 1.35 | 147 | 1.66 |
| 5 | 08 05 | 0 | 0.78 | 0.11 | 1.54 | 169 | 0.48 |
| | | 5 | 0.60 | 0.16 | 1.68 | 282 | 1.27 |
| | | 10 | 0.00 | 0.36 | 1.47 | 225 | 1.98 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 6 | 08 05 | 0 | 0.54 | 0.18 | 1.65 | 176 | 0.45 |
| | | 5 | 0.48 | 0.06 | 1.20 | 265 | 0.93 |
| | | 10 | 0.00 | 0.22 | 1.38 | 221 | 1.29 |
| 7 | 08 05 | 0 | 0.37 | 0.00 | 1.08 | 161 | 0.49 |
| | | 5 | 0.00 | 0.18 | 1.35 | 239 | 1.27 |
| | | 10 | 0.00 | 0.29 | 1.25 | 333 | 1.86 |
| 8 | 08 05 | 0 | 0.18 | 0.04 | 1.13 | 248 | 0.57 |
| | | 5 | 0.20 | 0.29 | 1.31 | 264 | 1.13 |
| | | 10 | 0.00 | 0.42 | 1.14 | 310 | 2.03 |
| 1 | 08 12 | 0 | 0.12 | 0.45 | 1.99 | 308 | 2.28 |
| | | 5 | 0.16 | 0.38 | 1.39 | 306 | 2.51 |
| | | 10 | 0.17 | 0.42 | 1.23 | 302 | 2.80 |
| 2 | 08 12 | 0 | 0.07 | 0.37 | 1.19 | 348 | 2.90 |
| | | 5 | 0.13 | 0.30 | 1.16 | 335 | 2.68 |
| | | 10 | 0.08 | 0.33 | 1.26 | 327 | 2.95 |

Table 6. (Cont'd)

| Station | Date | Depth m | $NO_3$ µmol $L^{-1}$ | $PO_4$ µmol $L^{-1}$ | DOC mg $L^{-1}$ | POC µg $L^{-1}$ | Ch a µg $L^{-1}$ |
|---|---|---|---|---|---|---|---|
| 3 | 08 12 | 0 | 0.15 | 0.19 | 1.24 | 355 | 2.02 |
| | | 5 | 0.06 | 0.22 | 1.49 | 201 | 2.09 |
| | | 10 | 0.12 | 0.36 | 1.48 | 603 | 3.57 |
| 4 | 08 12 | 0 | 0.06 | 0.32 | 1.16 | 323 | 1.68 |
| | | 5 | 0.00 | 0.43 | 1.11 | 328 | 2.03 |
| | | 10 | 0.08 | 0.51 | 1.18 | 567 | 3.10 |
| 5 | 08 10 | 0 | 0.64 | 0.13 | 1.34 | 155 | 0.73 |
| | | 5 | 0.00 | 0.28 | 1.10 | 167 | 0.74 |
| | | 10 | 0.33 | 0.40 | 1.36 | 184 | 2.12 |
| 6 | 08 10 | 0 | 0.00 | 0.17 | 1.44 | 203 | 0.62 |
| | | 5 | 0.00 | 0.06 | 1.17 | 129 | 0.60 |
| | | 10 | 0.00 | 0.35 | 1.28 | 251 | 1.95 |
| 7 | 08 10 | 0 | 0.00 | 0.25 | 1.18 | 161 | 0.70 |
| | | 5 | 0.00 | 0.09 | 1.09 | 126 | 0.73 |
| | | 10 | 0.00 | 0.31 | 1.33 | 181 | 2.04 |

Table 6. (Cont'd)

| Station | Date | Depth m | $NO_3$ µmol $L^{-1}$ | $PO_4$ µmol $L^{-1}$ | DOC mg $L^{-1}$ | POC µg $L^{-1}$ | Ch a µg $L^{-1}$ |
|---|---|---|---|---|---|---|---|
| 8 | 08 10 | 0 | 0.00 | 0.29 | 1.16 | 173 | 0.72 |
| | | 5 | 0.00 | 0.02 | 1.06 | 139 | 0.65 |
| | | 10 | 0.00 | 0.45 | 1.27 | 248 | 2.17 |
| 1 | 08 18 | 0 | 0.00 | 0.32 | 1.46 | 224 | 1.01 |
| | | 5 | 0.00 | 0.16 | 1.30 | 171 | 1.30 |
| | | 10 | 0.00 | 0.20 | 1.32 | 192 | 1.93 |
| 2 | 08 18 | 0 | 0.13 | 0.17 | 1.25 | 162 | 0.73 |
| | | 5 | 0.00 | 0.20 | 1.28 | 180 | 1.08 |
| | | 10 | 0.00 | 0.24 | 1.33 | 216 | 1.51 |
| 3 | 08 19 | 0 | 0.00 | 0.22 | 1.65 | 122 | 0.73 |
| | | 5 | 0.00 | 0.25 | 1.76 | 159 | 0.79 |
| | | 10 | 0.00 | 0.13 | 2.59 | 190 | 1.37 |
| 4 | 08 19 | 0 | 0.00 | 0.28 | 1.10 | 194 | 1.57 |
| | | 5 | 0.00 | 0.09 | 1.53 | 184 | 0.93 |
| | | 10 | 0.00 | 0.16 | 1.53 | 191 | 1.46 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 5 | 08 21 | 0 | 0.00 | 0.36 | 1.46 | 133 | 0.81 |
| | | 5 | 0.00 | 0.17 | 1.37 | 170 | 0.85 |
| | | 10 | 0.07 | 0.32 | 1.28 | 170 | 1.63 |
| 6 | 08 21 | 0 | 0.00 | 0.29 | 1.35 | 106 | 0.62 |
| | | 5 | 0.00 | 0.17 | 1.22 | 127 | 0.96 |
| | | 10 | 0.00 | 0.26 | 1.40 | 187 | 1.95 |
| 7 | 08 21 | 0 | 0.00 | 0.08 | 2.07 | 118 | 0.71 |
| | | 5 | 0.00 | 0.13 | 1.36 | 135 | 0.83 |
| | | 10 | 0.00 | 0.26 | 1.43 | 104 | 1.27 |
| 8 | 08 21 | 0 | 0.00 | 0.16 | 1.33 | 99 | 0.69 |
| | | 0 | 0.32 | 0.15 | 1.33 | 160 | 0.93 |
| | | 10 | 0.00 | 0.26 | 1.51 | 166 | 1.32 |
| 1 | 08 27 | 0 | 0.00 | 0.13 | 1.85 | 167 | 0.92 |
| | | 5 | 0.00 | 0.16 | 1.55 | 155 | 0.84 |
| | | 10 | 0.00 | 0.38 | 1.44 | 81 | 0.75 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 2 | 08 27 | 0 | 0.00 | 0.40 | 1.52 | 148 | 0.85 |
| | | 5 | 0.00 | 0.13 | 1.47 | 187 | 0.88 |
| | | 10 | 0.00 | 0.26 | 1.38 | 96 | 0.81 |
| 3 | 08 29 | 0 | 0.00 | 0.12 | 1.53 | 61 | 0.38 |
| | | 5 | 0.00 | 0.20 | 1.59 | 164 | 0.81 |
| | | 10 | 0.00 | 0.33 | 1.34 | 199 | 1.19 |
| 4 | 08 29 | 0 | 0.00 | 0.14 | 1.38 | 63 | 0.37 |
| | | 5 | 0.00 | 0.31 | 1.31 | 124 | 0.68 |
| | | 10 | 0.00 | 0.22 | 1.37 | 160 | 1.04 |
| 5 | 08 29 | 0 | 0.00 | 0.23 | 1.27 | 56 | 0.45 |
| | | 5 | 0.00 | 0.27 | 1.37 | 185 | 0.88 |
| | | 10 | 0.00 | 0.22 | 1.54 | 225 | 1.12 |
| 6 | 08 29 | 0 | 0.00 | 0.26 | 1.60 | 72 | 0.48 |
| | | 5 | 0.00 | 0.20 | 1.69 | 231 | 0.93 |
| | | 10 | 0.00 | 0.34 | 1.38 | 224 | 1.09 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 7 | 08 27 | 0 | 0.00 | 0.38 | 1.44 | 107 | 0.89 |
| | | 5 | 0.00 | 0.20 | 1.32 | 163 | 0.86 |
| | | 10 | 0.00 | 0.20 | 1.48 | 140 | 0.86 |
| 8 | 08 27 | 0 | 0.00 | 0.10 | 1.49 | 138 | 0.70 |
| | | 5 | 0.00 | 0.17 | 1.16 | 145 | 0.89 |
| | | 10 | 0.09 | 0.28 | 1.26 | 98 | 0.81 |
| 1 | 09 05 | 0 | 0.31 | 0.42 | 1.48 | 103 | 0.60 |
| | | 5 | 0.44 | 0.38 | 1.20 | 93 | 0.52 |
| | | 10 | 0.79 | 0.39 | 1.11 | 76 | 0.65 |
| 2 | 09 05 | 0 | 0.35 | 0.46 | 1.12 | 111 | 0.57 |
| | | 5 | 0.53 | 0.34 | 1.14 | 97 | 0.65 |
| | | 10 | 1.02 | 0.29 | 1.17 | 130 | 0.65 |
| 3 | 09 05 | 0 | 0.27 | 0.53 | 1.22 | 107 | 0.64 |
| | | 5 | 0.39 | 0.21 | 1.14 | 103 | 0.68 |
| | | 10 | 0.61 | 0.29 | 1.06 | 113 | 0.68 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 4 | 09 05 | 0 | 0.56 | 0.34 | 1.20 | 117 | 0.65 |
| | | 5 | 0.94 | 0.31 | 1.19 | 163 | 0.72 |
| | | 10 | 1.21 | 0.34 | 1.22 | 154 | 0.76 |
| 5 | 09 03 | 0 | 0.16 | 0.61 | 1.31 | 94 | 0.63 |
| | | 5 | 0.12 | 0.54 | 1.20 | 108 | 0.71 |
| | | 10 | 0.13 | 0.55 | 1.19 | 81 | 0.52 |
| 6 | 09 03 | 0 | 0.09 | 0.52 | 1.31 | 114 | 0.69 |
| | | 5 | 0.12 | 0.51 | 1.30 | 129 | 0.75 |
| | | 10 | 0.11 | 0.52 | 1.34 | 103 | 0.77 |
| 7 | 09 03 | 0 | 0.13 | 0.38 | 1.19 | 89 | 0.64 |
| | | 5 | 0.00 | 0.55 | 1.10 | 90 | 0.74 |
| | | 10 | 0.18 | 0.43 | 1.23 | 125 | 0.78 |
| 8 | 09 03 | 0 | 0.15 | 0.52 | 1.17 | 109 | 0.71 |
| | | 5 | 0.13 | 0.53 | 1.11 | 89 | 0.69 |
| | | 10 | 0.22 | 0.58 | 1.24 | 108 | 0.89 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 1 | 09 12 | 0 | 0.13 | 0.36 | 1.56 | 112 | 0.56 |
| | | 5 | 0.25 | 0.41 | 1.21 | 186 | 1.05 |
| | | 10 | 0.49 | 0.19 | 1.62 | 129 | 0.91 |
| 2 | 09 12 | 0 | 0.18 | 0.41 | 1.38 | 118 | 0.65 |
| | | 5 | 0.41 | 0.47 | 1.68 | 139 | 0.84 |
| | | 10 | 0.62 | 0.36 | 1.49 | 103 | 0.99 |
| 3 | 09 12 | 0 | 0.33 | 0.48 | 1.37 | 154 | 0.86 |
| | | 5 | 0.37 | 0.29 | 1.16 | 102 | 1.05 |
| | | 10 | 0.51 | 0.27 | 1.18 | 106 | 0.83 |
| 4 | 09 12 | 0 | 0.38 | 0.43 | 1.30 | 146 | 0.98 |
| | | 5 | 0.32 | 0.35 | 1.23 | 150 | 0.98 |
| | | 10 | 0.56 | 0.29 | 1.28 | 139 | 0.80 |
| 5 | 09 10 | 0 | 0.56 | 0.44 | 1.23 | 73 | 0.68 |
| | | 5 | 0.66 | 0.23 | 1.39 | 130 | 0.82 |
| | | 10 | 0.88 | 0.29 | 1.51 | 68 | 0.65 |

Table 6. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a |
|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 6 | 09 10 | 0 | 0.73 | 0.43 | 1.54 | 76 | 0.72 |
| | | 5 | 0.83 | 0.37 | 1.49 | 133 | 0.67 |
| | | 10 | 1.22 | 0.27 | 1.28 | 118 | 0.71 |
| 7 | 09 10 | 0 | 0.60 | 0.18 | 1.34 | 76 | 0.88 |
| | | 5 | 0.63 | 0.33 | 1.29 | 83 | 0.86 |
| | | 10 | 0.93 | 0.50 | 1.27 | 90 | 0.96 |
| 8 | 09 10 | 0 | 0.54 | 0.43 | 1.12 | 80 | 0.94 |
| | | 5 | 0.54 | 0.51 | 1.45 | 106 | 0.88 |
| | | 10 | 1.26 | 0.67 | 1.14 | 67 | 0.79 |

Table 7. Concentrations of reactive nitrate ($NO_3$), reactive phosphate ($PO_4$), dissolved organic carbon (DOC), particulate organic carbon (POC), chlorophyll *a* (Ch *a*) and phaeopigments (Phaeo.) from water samples collected in 1982.

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch *a* | Phaeo. |
|---|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 1 | 07 29 | 0 | 0.22 | 0.38 | 1.24 | 126 | 0.00 | 0.67 |
| | | 5 | 0.30 | 0.28 | 1.23 | 131 | 0.05 | 1.00 |
| | | 10 | 0.19 | 0.42 | 1.59 | 137 | 0.09 | 0.53 |
| 2 | 07 29 | 0 | 0.21 | 0.31 | 1.53 | 140 | 0.00 | 0.53 |
| | | 5 | 0.30 | 0.34 | 1.20 | 113 | 0.05 | 1.80 |
| | | 10 | 0.22 | 0.42 | 1.66 | 113 | 0.07 | 0.67 |
| 3 | 07 30 | 0 | 0.17 | 0.52 | 1.32 | 188 | 0.69 | 0.47 |
| | | 5 | 0.45 | 0.49 | 1.29 | 216 | 0.70 | 1.07 |
| | | 10 | 0.14 | 0.63 | 1.23 | 203 | 0.55 | 1.94 |
| 4 | 07 30 | 0 | 0.21 | 0.52 | 1.16 | 241 | 0.49 | 1.00 |
| | | 5 | 0.29 | 0.55 | 1.17 | 199 | 0.49 | 0.80 |
| | | 10 | 0.09 | 0.82 | 1.18 | 196 | 0.58 | 0.87 |
| 5 | 07 30 | 0 | 0.11 | 0.35 | 1.33 | 246 | 1.18 | 0.67 |
| | | 5 | 0.06 | 0.71 | 1.25 | 208 | 1.15 | 0.54 |
| | | 10 | 0.11 | 0.94 | 1.29 | 172 | 1.16 | 0.53 |

Table 7. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a | Phaeo. |
|---|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 6 | 07 30 | 0 | 0.08 | 0.73 | 1.25 | 252 | 1.25 | 0.13 |
| | | 5 | 0.11 | 0.83 | 1.21 | 187 | 1.13 | 0.13 |
| | | 10 | 0.13 | 0.80 | 1.19 | 176 | 1.30 | 0.00 |
| 7 | 07 30 | 0 | 0.13 | 0.51 | 1.14 | 207 | 0.80 | 0.00 |
| | | 5 | 0.13 | 0.59 | 1.09 | 223 | 0.79 | 0.00 |
| | | 10 | 0.16 | 0.56 | 1.20 | 188 | 0.85 | 0.07 |
| 8 | 07 30 | 0 | 0.17 | 0.40 | 1.04 | 225 | 0.93 | 1.04 |
| | | 5 | 0.64 | 0.75 | 1.09 | 234 | 1.02 | 0.00 |
| | | 10 | 0.26 | 0.40 | 1.09 | 146 | 1.09 | 0.47 |
| 1 | 08 02 | 0 | 0.32 | 0.32 | 1.13 | 97 | 0.29 | 0.00 |
| | | 5 | 0.09 | 0.18 | 1.07 | 112 | 0.28 | 0.40 |
| | | 10 | 0.12 | 0.47 | 1.16 | 233 | 0.39 | 0.13 |
| 2 | 08 02 | 0 | 0.00 | 0.11 | 0.97 | 98 | 0.27 | 0.00 |
| | | 5 | 0.16 | 0.18 | 1.14 | 123 | 0.33 | 0.13 |
| | | 10 | 0.47 | 0.46 | 1.10 | 164 | 0.50 | 0.27 |

Table 7. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch *a* | Phaeo. |
|---|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 3 | 08 02 | 0 | 0.23 | 0.23 | 1.06 | 107 | 0.29 | 0.13 |
| | | 5 | 0.17 | 0.23 | 1.01 | 140 | 0.33 | 0.00 |
| | | 10 | 0.12 | 0.46 | 1.21 | 148 | 0.83 | 0.00 |
| 4 | 08 02 | 0 | 0.10 | 0.20 | 1.05 | 115 | 0.43 | 0.07 |
| | | 5 | 0.13 | 0.44 | 1.07 | 137 | 0.51 | 0.00 |
| | | 10 | 0.07 | 0.51 | 1.18 | 157 | 0.81 | 0.00 |
| 5 | 08 02 | 0 | 0.21 | 0.34 | 1.17 | 209 | 0.32 | 0.20 |
| | | 5 | 0.11 | 0.44 | 0.94 | 129 | 0.44 | 0.00 |
| | | 10 | 0.00 | 0.45 | 1.08 | 181 | 0.73 | 0.00 |
| 6 | 08 02 | 0 | 0.15 | 0.11 | 1.00 | 59 | 0.33 | 0.00 |
| | | 5 | 0.07 | 0.34 | 1.05 | 125 | 1.02 | 0.00 |
| | | 10 | 0.11 | 0.46 | 1.02 | 54 | 0.58 | 0.00 |
| 7 | 08 02 | 0 | 0.21 | 0.24 | 1.02 | 49 | 0.16 | 0.00 |
| | | 5 | 0.15 | 0.24 | 0.96 | 117 | 0.21 | 0.07 |
| | | 10 | 0.16 | 0.78 | 1.14 | 140 | 0.62 | 0.07 |

Table 7. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a | Phaeo. |
|---|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 8 | 08 02 | 0 | 0.00 | 0.24 | 0.88 | 65 | 0.26 | 0.00 |
| | | 5 | 0.00 | 0.44 | 1.03 | 86 | 0.48 | 0.00 |
| | | 10 | 0.00 | 0.67 | 1.33 | 82 | 0.62 | 0.00 |
| 1 | 08 10 | 0 | 0.06 | 0.24 | 1.19 | 104 | 0.20 | 0.47 |
| | | 5 | 0.00 | 0.33 | 1.07 | 77 | 0.25 | 0.07 |
| | | 10 | 0.09 | 0.78 | 1.19 | 117 | 0.28 | 0.00 |
| 2 | 08 10 | 0 | 0.00 | 0.24 | 0.95 | 99 | 0.18 | 0.00 |
| | | 5 | 0.00 | 0.22 | 1.00 | 94 | 0.21 | 0.20 |
| | | 10 | 0.00 | 0.72 | 1.06 | 96 | 0.23 | 0.13 |
| 3 | 08 10 | 0 | 0.00 | 0.12 | 0.92 | 103 | 0.27 | 0.00 |
| | | 5 | 0.06 | 0.20 | 1.01 | 74 | 0.17 | 0.07 |
| | | 10 | 0.41 | 0.52 | 1.03 | 94 | 0.27 | 0.80 |
| 4 | 08 10 | 0 | 0.13 | 0.12 | 0.99 | 95 | 0.19 | 0.20 |
| | | 5 | 0.08 | 0.26 | 1.01 | 90 | 0.25 | 0.07 |
| | | 10 | 0.06 | 0.47 | 1.05 | 2185 | 0.67 | 1.34 |

Table 7. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a | Phaeo. |
|---|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 5 | 08 09 | 0 | 0.00 | 0.11 | 1.17 | 209 | 0.07 | 0.07 |
| | | 5 | 0.07 | 0.47 | 0.94 | 129 | 0.29 | 0.00 |
| | | 10 | 0.06 | 0.64 | 1.08 | 181 | 0.46 | 0.40 |
| 6 | 08 09 | 0 | 0.06 | 0.07 | 1.00 | 59 | 0.15 | 0.00 |
| | | 5 | 0.08 | 0.41 | 1.05 | 125 | 0.43 | 0.47 |
| | | 10 | 0.12 | 0.54 | 1.02 | 54 | 0.24 | 0.07 |
| 7 | 08 09 | 0 | 0.07 | 0.05 | 1.02 | 49 | 0.15 | 0.00 |
| | | 5 | 0.08 | 0.47 | 0.96 | 117 | 0.21 | 0.07 |
| | | 10 | 0.13 | 0.49 | 1.14 | 140 | 0.32 | 0.00 |
| 8 | 08 09 | 0 | 0.10 | 0.19 | 0.88 | 65 | 0.15 | 0.00 |
| | | 5 | 0.08 | 0.47 | 1.03 | 86 | 0.29 | 0.07 |
| | | 10 | 0.15 | 0.55 | 1.33 | 82 | 0.31 | 0.00 |
| 1 | 08 16 | 0 | 0.00 | 0.38 | 1.48 | 178 | 0.14 | 0.33 |
| | | 5 | 0.14 | 0.53 | 1.38 | 187 | 0.46 | 0.13 |
| | | 10 | 0.00 | 0.53 | 1.21 | 114 | 0.51 | 0.20 |

Table 7. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a | Phaeo. |
|---|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 2 | 08 16 | 0 | 0.00 | 0.47 | 1.07 | 102 | 0.26 | 0.13 |
| | | 5 | 0.00 | 0.55 | 1.43 | 157 | 0.63 | 1.00 |
| | | 10 | 0.00 | 0.66 | 1.20 | 176 | 0.49 | 0.33 |
| 3 | 08 16 | 0 | 0.00 | 0.51 | 1.07 | 112 | 0.18 | 0.20 |
| | | 5 | 0.00 | 0.45 | 1.16 | 173 | 0.40 | 0.07 |
| | | 10 | 0.00 | 0.54 | 1.30 | 201 | 0.45 | 0.33 |
| 4 | 08 16 | 0 | 0.09 | 0.48 | 1.14 | 131 | 0.24 | 0.00 |
| | | 5 | 0.10 | 0.50 | 0.95 | 137 | 0.40 | 0.00 |
| | | 10 | 0.09 | 0.59 | 1.11 | 147 | 0.44 | 0.33 |
| 5 | 08 14 | 0 | 0.21 | 0.45 | 1.33 | 150 | 0.12 | 0.20 |
| | | 5 | 0.17 | 0.53 | 1.11 | 414 | 0.41 | 0.67 |
| | | 10 | 0.17 | 0.64 | 1.03 | 161 | 0.41 | 0.33 |
| 6 | 08 14 | 0 | 0.18 | 0.40 | 0.91 | 93 | 0.10 | 0.33 |
| | | 5 | 0.18 | 0.49 | 1.00 | 107 | 0.21 | 1.00 |
| | | 10 | 0.26 | 0.65 | 1.13 | 121 | 0.34 | 0.40 |

Table 7. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a | Phaeo. |
|---|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 7 | 08 14 | 0 | 0.22 | 0.44 | 0.99 | 73 | 0.12 | 0.07 |
| | | 5 | 0.34 | 0.36 | 1.02 | 120 | 0.32 | 0.27 |
| | | 10 | 0.29 | 0.60 | 1.04 | 101 | 0.26 | 0.40 |
| 8 | 08 14 | 0 | 0.24 | 0.37 | 1.01 | 81 | 0.02 | 0.53 |
| | | 5 | 0.25 | 0.42 | 1.22 | 108 | 0.29 | 0.67 |
| | | 10 | 0.26 | 0.51 | 1.16 | 125 | 0.28 | 0.67 |
| 1 | 08 30 | 0 | 0.28 | 0.58 | 1.22 | 180 | 0.52 | 0.20 |
| | | 5 | 0.28 | 0.63 | 1.35 | 234 | 0.88 | 0.40 |
| | | 9 | 0.32 | 0.68 | 2.00 | 157 | 1.08 | 0.07 |
| 2 | 08 30 | 0 | 0.26 | 0.55 | 1.27 | 136 | 0.97 | 0.00 |
| | | 5 | 0.23 | 0.57 | 1.20 | 172 | 1.10 | 0.47 |
| | | 10 | 0.24 | 0.59 | 0.81 | 162 | 1.35 | 0.00 |
| 3 | 08 30 | 0 | 0.23 | 0.54 | 1.18 | 163 | 0.94 | 0.00 |
| | | 5 | 0.19 | 0.60 | 1.18 | 62 | 0.95 | 0.00 |
| | | 10 | 0.20 | 0.70 | 1.59 | 91 | 0.67 | 0.00 |

Table 7. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a | Phaeo. |
|---|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 4 | 08 30 | 0 | 0.08 | 0.61 | 1.22 | 188 | 0.98 | 0.00 |
| | | 5 | 0.08 | 0.61 | 1.21 | 158 | 0.49 | 0.94 |
| | | 10 | 0.08 | 0.66 | 1.61 | 162 | 1.03 | 0.00 |
| 5 | 08 28 | 0 | 0.07 | 0.54 | 1.46 | 130 | 0.61 | 0.00 |
| | | 5 | 0.09 | 0.58 | 1.77 | 247 | 0.64 | 1.07 |
| | | 10 | 0.09 | 0.61 | 1.14 | 196 | 1.04 | 0.00 |
| 6 | 08 28 | 0 | 0.09 | 0.65 | 1.12 | 130 | 0.53 | 0.00 |
| | | 5 | 0.13 | 0.68 | 1.26 | 199 | 0.80 | 0.00 |
| | | 10 | 0.13 | 0.74 | 1.17 | 164 | 0.90 | 0.00 |
| 7 | 08 28 | 0 | 0.20 | 0.64 | 1.13 | 206 | 0.53 | 0.00 |
| | | 5 | 0.19 | 0.66 | 1.09 | 173 | 0.67 | 0.00 |
| | | 8 | 0.20 | 0.73 | 1.25 | 225 | 0.70 | 0.00 |
| 8 | 08 28 | 0 | 0.21 | 0.68 | 1.33 | 196 | 0.62 | 0.00 |
| | | 5 | 0.21 | 0.65 | 1.04 | 237 | 0.71 | 0.00 |
| | | 9 | 0.17 | 0.77 | 2.48 | 304 | 0.84 | 0.00 |

Table 7. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a | Phaeo. |
|---|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 1 | 09 06 | 0 | 0.13 | 0.60 | 1.39 | 115 | 0.36 | 0.20 |
| | | 5 | 0.13 | 0.63 | 1.43 | 170 | 0.54 | 0.00 |
| | | 9 | 0.13 | 0.58 | 1.38 | 192 | 0.59 | 0.33 |
| 2 | 09 06 | 0 | 0.08 | 0.60 | 1.17 | 166 | 0.38 | 0.13 |
| | | 5 | 0.07 | 0.64 | 1.35 | 194 | 0.32 | 0.40 |
| | | 8 | 0.10 | 0.84 | 1.16 | 214 | 0.61 | 0.47 |
| 3 | 09 06 | 0 | 0.11 | 0.58 | 1.27 | 104 | 0.34 | 0.67 |
| | | 5 | 0.09 | 0.61 | 1.14 | 166 | 0.38 | 0.53 |
| | | 8 | 0.13 | 0.70 | 1.21 | 217 | 0.73 | 0.67 |
| 4 | 09 06 | 0 | 0.42 | 0.78 | 1.93 | 187 | 0.32 | 0.20 |
| | | 5 | 0.21 | 0.75 | 1.21 | 145 | 0.40 | 0.13 |
| | | 8 | 0.66 | 0.67 | 1.71 | 171 | 0.49 | 0.07 |
| 5 | 09 03 | 0 | 0.79 | 0.53 | 1.46 | 134 | 0.41 | 0.07 |
| | | 5 | 0.22 | 0.58 | 1.19 | 142 | 0.46 | 0.20 |
| | | 8 | 0.24 | 0.74 | 1.24 | 100 | 0.44 | 0.40 |

Table 7. (Cont'd)

| Station | Date | Depth | $NO_3$ | $PO_4$ | DOC | POC | Ch a | Phaeo. |
|---|---|---|---|---|---|---|---|---|
| | | m | µmol $L^{-1}$ | µmol $L^{-1}$ | mg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ | µg $L^{-1}$ |
| 6 | 09 03 | 0 | 0.16 | 0.50 | 1.11 | 110 | 0.43 | 0.87 |
| | | 5 | 0.13 | 0.58 | 1.15 | 133 | 0.40 | 0.07 |
| | | 8 | 0.15 | 0.76 | 1.15 | 160 | 0.32 | 0.40 |
| 7 | 09 03 | 0 | 0.23 | 0.49 | 1.12 | 130 | 0.27 | 0.74 |
| | | 5 | 0.19 | 0.60 | 1.13 | 151 | 0.38 | 0.27 |
| | | 8 | 0.18 | 0.68 | 1.15 | 167 | 0.30 | 0.54 |
| 8 | 09 03 | 0 | 0.10 | 0.41 | 1.24 | 157 | 0.28 | 0.74 |
| | | 5 | 0.10 | 0.57 | 1.11 | 147 | 0.53 | 1.00 |
| | | 8 | 0.10 | 0.49 | 1.20 | 164 | 0.33 | 1.07 |

Table 8. Concentrations of total organic carbon (TOC) determined from homogenized sediment samples collected in 1981.

| Station | Date | TOC % |
|---|---|---|
| 1 | 08 10 | 0.96 |
| 2 | 08 10 | 0.89 |
| 3 | 08 07 | 2.60 |
| 4 | 08 07 | 2.56 |
| 5 | 08 09 | 1.01 |
| 6 | 08 09 | 0.98 |
| 7 | 08 07 | 2.41 |
| 8 | 08 07 | 2.70 |
| 1 | 08 14 | 2.67 |
| 2 | 08 14 | 2.55 |
| 3 | 08 14 | 2.99 |
| 4 | 08 14 | 3.03 |
| 5 | 08 18 | 1.80 |
| 6 | 08 18 | 1.16 |
| 7 | 08 16 | 2.80 |
| 8 | 08 16 | 3.08 |
| 1 | 08 23 | 2.29 |
| 2 | 08 23 | 2.01 |
| 3 | 08 23 | 2.94 |
| 4 | 08 23 | 2.72 |
| 5 | 08 24 | 2.02 |
| 6 | 08 24 | 1.90 |
| 7 | 08 23 | 3.46 |
| 8 | 08 23 | 3.37 |
| 7 | 08 26 | 3.45 |
| 8 | 08 26 | 2.45 |

Table 8. (Cont'd)

| Station | Date | TOC % |
|---|---|---|
| 1 | 08 31 | 1.73 |
| 2 | 08 31 | 1.77 |
| 3 | 08 31 | 2.05 |
| 4 | 08 31 | 2.10 |
| 5 | 08 31 | 2.08 |
| 6 | 08 31 | 1.33 |
| 7 | 09 01 | 2.73 |
| 8 | 09 01 | 3.10 |
| 1 | 09 06 | 1.62 |
| 2 | 09 06 | 1.96 |
| 3 | 09 06 | 2.57 |
| 4 | 09 06 | 2.21 |
| 5 | 09 06 | 1.99 |
| 6 | 09 06 | 1.79 |
| 7 | 09 06 | 2.36 |
| 8 | 09 06 | 1.46 |
| 1 | 09 13 | 1.58 |
| 2 | 09 13 | 1.39 |
| 3 | 09 13 | 2.39 |
| 4 | 09 13 | 2.69 |
| 5 | 09 13 | 1.82 |
| 6 | 09 13 | 2.02 |
| 7 | 09 13 | 2.65 |
| 8 | 09 13 | 2.43 |

Table 8. (Cont'd)

| Station | Date | TOC % |
|---|---|---|
| 1 | 09 19 | 2.31 |
| 2 | 09 19 | 1.42 |
| 3 | 09 19 | 2.54 |
| 4 | 09 19 | 2.90 |
| 5 | 09 19 | 1.90 |
| 6 | 09 19 | 1.96 |
| 7 | 09 19 | 2.78 |
| 8 | 09 19 | 2.89 |

Table 9. Concentrations of total organic carbon (TOC), determined from homogenized sediment samples, and reactive nitrate ($NO_3$), reactive phosphate ($PO_4$) and ammonia ($NH_3$), determined from interstitial water samples collected in 1982.

| Station | Date | $NO_3$ | $PO_4$ | $NH_3$ | TOC |
|---|---|---|---|---|---|
| | | µmol $L^{-1}$ | µmol $L^{-1}$ | µmol $L^{-1}$ | % |
| 1 | 08 05 | 0.40 | 1.47 | 12.90 | 2.23 |
| 2 | 08 05 | -- | -- | -- | 1.98 |
| 3 | 08 05 | 0.17 | 2.10 | 6.05 | 2.34 |
| 4 | 08 05 | -- | -- | -- | 2.26 |
| 5 | 08 06 | 0.29 | 4.14 | 15.59 | 2.19 |
| 6 | 08 06 | -- | -- | -- | 2.55 |
| 7 | 08 05 | 0.12 | 0.60 | 3.17 | 2.67 |
| 8 | 08 05 | -- | -- | -- | 2.73 |
| 1 | 08 11 | 0.44 | 2.33 | -- | 1.50 |
| 2 | 08 11 | -- | -- | -- | 1.84 |
| 3 | 08 11 | 0.20 | 6.19 | 12.81 | 2.65 |
| 4 | 08 11 | -- | -- | -- | 2.65 |
| 5 | 08 13 | 0.35 | 5.40 | 11.94 | 2.37 |
| 6 | 08 13 | -- | -- | -- | 2.46 |
| 7 | 08 11 | 0.14 | 0.87 | 4.93 | 2.60 |
| 8 | 08 11 | -- | -- | -- | 1.64 |
| 1 | 08 18 | 0.10 | 4.89 | 17.68 | 1.87 |
| 2 | 08 18 | -- | -- | -- | 1.80 |
| 3 | 08 18 | 0.26 | 2.32 | 16.20 | 2.69 |
| 4 | 08 18 | -- | -- | -- | 2.74 |
| 5 | 08 19 | 0.23 | 3.58 | 24.18 | 2.32 |
| 6 | 08 19 | -- | -- | -- | 2.34 |
| 7 | 08 18 | 0.11 | 0.89 | 8.02 | 3.20 |
| 8 | 08 18 | -- | -- | -- | 2.96 |

Table 9. (Cont'd)

| Station | Date | $NO_3$ | $PO_4$ | $NH_3$ | TOC |
|---|---|---|---|---|---|
| | | µmol $L^{-1}$ | µmol $L^{-1}$ | µmol $L^{-1}$ | % |
| 1 | 08 25 | 0.20 | 0.97 | 3.21 | 2.10 |
| 2 | 08 25 | -- | -- | -- | 2.21 |
| 3 | 08 25 | 0.10 | 1.41 | 25.44 | 2.73 |
| 4 | 08 25 | -- | -- | -- | 2.77 |
| 5 | 08 26 | 0.21 | 1.80 | 10.38 | 2.35 |
| 6 | 08 26 | -- | -- | -- | 2.49 |
| 7 | 08 25 | 0.34 | 1.10 | 14.90 | 2.95 |
| 8 | 08 25 | -- | -- | -- | 2.98 |
| 1 | 09 01 | 0.43 | 1.78 | 4.97 | 2.09 |
| 3 | 09 01 | 0.10 | 1.07 | 3.80 | 2.79 |
| 4 | 09 01 | -- | -- | -- | 2.46 |
| 5 | 09 02 | 0.17 | 3.19 | 15.56 | -- |
| 6 | 09 01 | -- | -- | -- | 2.38 |
| 7 | 09 01 | 0.06 | 1.46 | 5.72 | 3.05 |
| 8 | 09 01 | -- | -- | -- | 2.97 |
| 1 | 09 08 | 0.14 | 2.89 | 8.25 | 2.43 |
| 2 | 09 08 | -- | -- | -- | 2.13 |
| 3 | 09 08 | 0.15 | 1.04 | 1.65 | 2.63 |
| 4 | 09 08 | -- | -- | -- | 2.38 |
| 5 | 09 08 | 0.20 | 6.51 | 14.56 | 1.88 |
| 6 | 09 08 | -- | -- | -- | 1.77 |
| 7 | 09 08 | 0.20 | 2.52 | 8.45 | 2.58 |
| 8 | 09 08 | -- | -- | -- | 2.58 |

Table 9. (Cont'd)

| Station | Date | $NO_3$ | $PO_4$ | $NH_3$ | TOC |
|---|---|---|---|---|---|
| | | µmol $L^{-1}$ | µmol $L^{-1}$ | µmol $L^{-1}$ | % |
| 1 | 09 12 | 0.41 | 3.07 | 6.77 | 1.68 |
| 2 | 09 12 | -- | -- | -- | 2.26 |
| 3 | 09 12 | 0.32 | 1.20 | 1.32 | 2.88 |
| 4 | 09 12 | -- | -- | -- | 2.68 |
| 5 | 09 12 | 0.47 | 6.39 | 28.99 | 2.09 |
| 6 | 09 12 | -- | -- | -- | 2.47 |
| 7 | 09 12 | 0.25 | 1.21 | 14.80 | 2.86 |
| 8 | 09 12 | -- | -- | -- | 2.85 |